Aalto University
School of Business

Integrating environmental performance measurement with management accounting practices

Case study: Company X

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Abstract

Currently environmental issues are moving closer and closer to businesses shaping their surrounding environment. Regulations, customer preferences and big trends are pushing businesses to focus more on environmental issues and to improve their environmental performance. Current technology provides sophisticated, highly advanced methods for organizations to measure their environmental performance. However there are still strong challenges and organizations still struggle to accordingly measure and improve their performance.

This study provides a modern example how environmental performance measurement can be integrated into the existing management accounting practices. Previous literature has highlighted the complexity of environmental performance measuring practices and some authors have claimed that environmental performance measurement should not be aligned with management accounting processes, or nor do such a processes have any value of organizations. However this study found significant evidence for the favor of integrated environmental performance measurement processes. The case company has gained significant comparative advantage due to successful integration of accounting and environmental performance measurement processes.

This study was also focusing on to observe what are the challenges towards successful integration. Formal structures and processes, such as environmental management accounting (EMA) and environmental management systems (EMS) do have significant supporting role in executing the integration. These processes have to able to collect, transfer and provide tools for assessment of environmental performance data via environmental performance indicators (EPI). While the formal processes have an important role, this study also highlights the influence and role of organizational culture. The culture clearly defines how supportive and pro-active employees are at utilizing and developing EMA and EMS processes. Since environmental related issues rarely are expertise area among the controllers and other accounting professionals, the existing organizational culture have to support environmental targets and the usage of EMA processes.

Keywords: Environmental performance measurement, environmental management accounting, environmental management systems, environmental performance indicators, EMA, EMS, EPI

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Tiivistelmä

Tällä hetkellä ympäristöongelmat liikkuvat yhä lähemmäksi yrityksiä muokaten ympäröivää toimintaympäristöä. Määräykset, asiakasvaatimukset ja ”big trends” vaativat yrityksiä keskittymään enemmän ympäristöongelmiin ja parantamaan omaa ympäristösuoriutumistaan. Tällä hetkellä teknologia tarjoaa kehittyneitä ratkaisuja organisaatioille ympäristösuoriutumisen mittaamiseen. Kumminkin ongelmia on yhä, ja organisaatiot kokevatkin paljon ongelmia oman suoriutumisensa mittaamisessa.

Tämä tutkimus tarjoaa modernin esimerkin siitä, kuinka ympäristösuoriutumisen mittaamisen voi yhdistää johdon laskentatoimen toimintoihin. Aikaisempi akateeminen kirjallisuus on nostanut esiin ympäristösuoriutumismittaamisen monimutkaisuuden ja tutkijat ovat väittäneet, että ympäristösuoriutumismittaamista ei edes pitäisi yrittää yhdistää johdon laskentatoimen prosesseihin, eikä tällaisilla prosesseilla ole mitään arvoa organisaatioille itsessään. Tämä tutkimus kumminkin löysi merkittävää evidenssiä integroidun ympäristömittaamisen hyödyistä. Tutkittava yritys on saanut huomattavaa kilpailullista etua onnistuneesta integroidusta ympäristösuoriutumis- ja laskentatoimiprosesseista

Tämä tutkimus keskittyy myös havainnoimaan minkälaisia ongelmia näiden toimintojen integraatioon liittyy. Muodollisilla prosesseilla ja rakenteilla, kuten ympäristölaskentatoimella (EMA) and ympäristöjohtamisjärjestelmillä (EMS) on tämän tutkimuksen perusteella merkittävä rooli integroitaessa näitä kahta toimintoa. Näiden prosessien täytyy kerätä, siirtää ja tarjota työkaluja ympäristösuoristumisdatan arviointiin ja hyväksikäyttäen ympäristöindikaattoreita (EPI) Vaikka muodollisilla prosesseilla on tärkeä rooli, tämä tutkimus nostaa esiin myös yrityskulttuurin merkityksen. Yrityskulttuuri selkeästi vaikuttaa ja määrittelee kuinka oma-aloitteisia työntekijät ovat hyödyntämään ja kehittämään EMA- ja EMS- prosesseja. Koska ympäristöasiat harvoin ovat laskentatoimen ammattilaisten ydinosaamisaluetta, yrityskulttuurin pitää tukea ympäristötavoitteita ja EMA- prosessien käyttöä.

Avainsanat: Environmental performance measurement, environmental management accounting, environmental management systems, environmental performance indicators, EMA, EMS, EPI

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1. INTRODUCTION

Environmental aspects have been getting more focus in the global business context while sustainability issues have become one of the most challenging problems of the 21st century (Bititci et al., 2012). According to Committee on Climate Change (COCC, 2016) global CO2 emissions should be reduced globally by 50 percent from the year 2010 level by the year 2050 in order to avoid causing permanent damage for Earth's ecosystems. By the Paris Agreement, western countries should be reducing their carbon emissions even 95% from the 2010 level as a part of plan to avoid average global temperature to rise above two-Celsius degrees. In order to decrease environmental impacts, corporates should start to act sustainably (Olsthoorn et al., 2000). Sustainability as a concept is not new. It has been existing as phenomena already in the 90's century, when sustainability thinking started to get attention from the corporate side (Holliday, 2001; World Business Council for Sustainability Development, 2002. At the time, several academic authors started to publish research papers regarding corporate sustainability (Porter & van der Linde, 1995; Elkington, 1999) who found sustainability approach to become more visible in business context as well.

One of the most visible changes during the recent decades in corporates have been the increased amount of disclosed sustainability reports which are nowadays a unwritten standard in most industries (Lozano & Huising, 2010). This had led executives to build-up a place and time for measuring and reporting their sustainability, even though progress is still on and need for further improvements are visible (Niskala, 2012). In the heart of the change is capability to measure and assess organizations' environmental performance. Even though technologies for performance improvements exist, the more complex issue is to understand and analyze where companies can most efficiently reduce their emissions and resource usage (Bertels et al., 2010). The lack of best practices and knowledge is creating a net of open, unclear issues for several firms (Caliskan, 2014). Traditionally firms have given performance measuring activities for business controllers and other accounting functions. Regarding measuring environmental performance, traditional management accounting practices are missing the knowledge to measure environmental impacts and expenses (Burritt, 2004). This creates a challenge for organizations: how to combine traditional accounting measuring practices and knowledge with a challenging environmental management field (Caliskan, 2014). For to

succeed in environmental management, corporates have to merge environmental performance measuring practices into their daily management accounting practices (Lee, 2011).

While governments around the world are implementing and adjusting new legislations, changes in the consumer behavior is escalating at the same time (Spaargaren & Oosterweer, 2010). Environmental subjects are getting more focus in the risk assessments since some of the traditional materials and energy resources are becoming more and scarcer, and non-ecologic corporate decisions can sling customers away from the business. Being "green" have also turned to be an advantage in several industries, where competition of the market cut is harsh and goal to pleasure consumers' needs is vital (Krajnc et al., 2012). Therefore, corporations are in the crossfire of traditional targets and new stakeholder pressure, leading to the growing consensus of corporate sustainability issues.

1.1 RESEARCH QUESTION AND OBJECTIVES

Measuring environmental performance throughout operative field and supply chain is a problematic concept since businesses traditionally have not been focusing on measuring externalities of their actions, especially not in the context of environmental performance (Lee, 2011). While businesses have certain competitive knowledge and practice areas, environmental performance rarely is the firms' competitive edge. Integrating environmental performance measurement with management accounting is problematic and not easy integration to execute (Burritt, 2004; Bertels et al., 2010).

The purpose of this study is to deepen understanding of the environmental performance measurement and its linkage to the management accounting practices. More deeply, this study will examine *how* environmental performance measurement practices can be integrated to the management accounting processes. Additional emphasis is given to understand some of most dominant *problems* and *challenges* rejecting successful integration of environmental performance measurement.

The research question for this study is:

- *How environmental performance measurement can be integrated with accounting practices?*

Addition to the main research questions this study includes sub-research questions:

- *What makes the integration and utilization of environmental performance measurement challenging?*

This study tries to find answers for those research questions by investigating one Finnish publicly listed company currently operating in the energy and renewable materials industries. This company has successfully created functioning integration for environmental performance measuring structures and processes together with management accounting practices. The study has been conducted from management accounting perspective in order to conceive the integration between environmental performance measurement and management accounting. To frame the approach of this study, different theoretical models have been selected for to reflect and evaluate the environmental performance measurement systems and practices of the case company.

This study contributes both management accounting and environmental performance measurement literature. The contribution can be found for studies such as Henri and Journeault, (2007) and Burritt (2004) who studied firms' and organizations' characteristics and how those influence on corporate environmental performance measurement and management accounting processes. More recent study (Burritt & Schaltegger, 2010) raised the question of how environmental management accounting is actually taking its place in the practice and how it is visible in organizations. As Burritt and Schaltegger state, current research is more focused to describe and analyze the effectiveness of the tools than describing the actual reality. The research gap which this study aims to fill is concrete: we still no relatively little about how organizations actually have linked their environmental performance measurement and management accounting processes (Ballou et al., 2012; Bititci, et al., 2012) or nor do we have experience which environmental indicators are actually effective in practical implementations (Hák et al., 2011).

1.3 OUTLINE OF THE RESEARCH

At the beginning in this paper, the approach and purpose is to provide an short overview for the development of management accounting and performance measurement literature over the recent decades. From the management accounting and performance measuring theories, this study goes further to present how environmental performance measurement is organized and visible in the organizations from theoretical perspective. In chapter 3 most relevant theories and development areas are presented regarding the environmental management and performance measurement. While the theory is relatively young and open, getting the understanding of the basic principles is vital for understanding the conspectus and the framework where the empirical research is moving. Chapter 4 combines previous chapters together: how existing literature rationalizes and discuss about integration between management accounting and environmental performance measurement. In addition, practical examples and models are explained. In chapter 5 empirical research is presenting findings that were concluded from the interviews and other examined materials. After findings, this paper has a separate discussion and conclusion sections that summarize findings, analyze those and give suggestions for further studies.

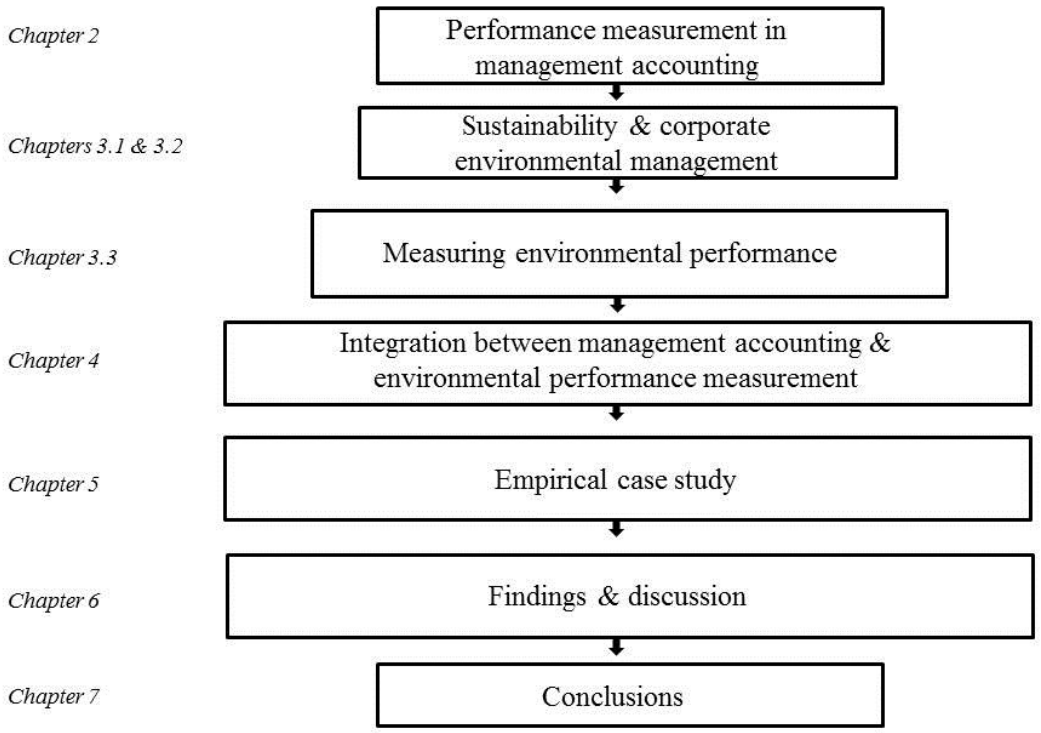

Figure 1, Structure of the thesis

2. MEASURING PERFORMANCE IN MANAGEMENT ACCOUNTING

This chapter will present existing literature and research fields around the management accounting and performance measuring concepts. Management accounting has contributed to current performance measuring study significantly, thus this chapter will at first introduce prior development path of management accounting. From historical overview, the chapter will move to introducing the connection between management accounting and performance measuring. The closer attention will be given for performance measurement theories itself. Why is performance measurement done and why it matters? Why and how organizations are measuring their performance? This chapter tries to introduce the main concepts, thus due to limits of this research, only a small amount of prior research in the field of performance measurement and management is able to be included in this study. Selected approaches and theories for this paper try to provide as comprehensive picture for the reader as possible. After reading this literature chapter, reader should have an appropriate knowledge to follow the summation of environmental management and performance measuring which will be discussed in the following literature-viewing chapters, in chapters 3 and 4.

2.1 HISTORY AND THEORIES OF MANAGEMENT ACCOUNTING AND PERFORMANCE MEASUREMENT

Management accounting has received its current place and form in the 1980's when its influence and interest spread to include several, currently strongly dominating new areas (Hestford et.al, 2007). Cost accounting practices, together with other areas of accounting, were initially meant for to fulfill requirements of external reporting and management accounting was only later designed to support management in decision-making and planning (Burritt, 2010). Modern management accounting includes, among in many other organization internal areas, several research areas such as cost management, capital budgeting, strategic accounting and financial accounting. One of the modern key research areas is performance measuring and management.

Briefly explained, measuring performance can be defined as a constant process, following how efficiently inputs (labor, machineries, technology, financial resources etc.) are converted as value-adding outputs (services or products). Both inputs and outputs can be intangible or tangible or something that does not have necessarily monetary value but value for the organization or its stakeholders in other forms. The balance between inputs and outputs finally determinates how efficient the organization is. Performance measurement can be executed on any level of the organization, starting from the individual sales events ending up to performance measurements that cover the whole organization's performance. To support decision-making and management, performance measuring is aiming to provide information from this complex process and to measure and manage processes' efficiencies accordingly (Olsthoorn et al., 2000).

Performance measurement is linked to the management accounting practices that is the main tool for internal decision-making (Kaplan & Atkinson, 1989). In management accounting, performance indicators and measurement have traditionally gained attention and research from a wide range (Atkinson et al., 1997; Simons, 2000; Dess & Robinson, 1984; Kaplan 1983; Otley 1999). A classic view, conducted by Robert Anthony (1965, pp. 17) sees performance measurement, and more correctly management control as "…*the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organizations' objectives.*". Anthony's model became over time criticized by its limitations towards strategic alignment, encouraging research to focus too narrow area, often formal accounting processes (Ferreira & Otley, 2009). Nowadays performance management studies are trying to capture more comprehensive approach to performance measurement, indicating the need to understand management control and performance measurement as a one broader phenomena which have physical and non-physical elements, such as formal accounting processes and tools and organizational culture and norms (Ferreira & Otley, 2009; Malmi and Brown, 2008).

As explained previously, nor is performance measurement only implementable in operative level, but also in to the strategic level. Strategic planning with performance measurement has received a lot of attention from several management accounting scholars such as Kaplan and Norton (2001), Haas and Kleingeld (1999), Otley (2009). For strategy, performance measuring is vital. Organizations have always tried to measure and forecast if their strategic goals are going to be achieved or not. Organizations seek for tools to navigate in a strategic

field, where performance measuring practices can act as providers for valuable information for the management decision processes.

Balance Scorecard (BSC), presented by Kaplan and Norton in 1992 is famous performance management tool for strategic business planning. Balance Score Card institution itself describe BSC (2016) as an "*framework that add strategic non-financial performance measures to traditional financial metrics to give managers and executives a more 'balanced' view of organizational performance*." While traditionally firms have been focusing on financial performance indicators only, BSC adds non-financial measures to support the decision-making and to add additional sources for valuable information (Jordan & Messner, 2012). As Balance Score Card institution (2016) further explains: "*The "new" balanced scorecard transforms an organization's strategic plan from an attractive but passive document into the "marching orders" for the organization on a daily basis. It provides a framework that not only provides performance measurements, but helps planners identify what should be done and measured. It enables executives to truly execute their strategies."*. BSC includes several approaches to investigate business operative planning and strategic goal aligning. Identifying correct performance measurements indicators supports organizations' goals in tracking the progress of achieving strategic goals. As a part of the set of tools, sustainability, including environmental performance measurement can be one part of the strategic and operational BSC (Andrew & Cortese, 2011).

From the strategy level down in the organizational hierarchy, measuring performance is connected to operational planning and control systems. This more practical and operational framework is called management control systems (MCS) which follow BSC and provides tools for implementing strategic plan to concrete performance plans and performance indicators (Malmi & Brown, 2008). MCS are operational management tools which can include same strategic performance indicators than BSC, however management control systems are to support daily operative management where BSC is focusing broader strategy objectives. These systems provide information for decision makers, by collecting data from the indicators, to set-up further actions in order to guide and maintain the organization on a right track (Otley, 1999). For example, diminishing amount of purchase transaction per day or increased raw material prices are signals for to awake managers' attention.

As it turns out, for organizations implementing strategic goals for lower hierarchical level is a challenging task which managers often struggle (Jordan & Messner, 2012). Traditionally

firms have been measuring their performance as a whole, ending up with the performance indicators such as ROE, profit margins and revenue multiples. When it comes to the lower level, performance measurement can be implemented even on the individual product segments, categories, and individual customer purchases. As Bourne et al. (2000) explain, the implementation phase of performance measurement is as well a problematic area since organizational resistance can occur due to increased measurements and performance assessment of employees' inputs. Meanwhile organizations are more and more becoming to be involved in continuing performance management and measuring the crucial role have landed on employees' and other organization members' desks giving them possibility and burden to involve into the process (Kennerley & Neely, 2003). Creating, collecting, analyzing and managing the performance data require commitment from the entire organization.

To combine performance measurement, operative level and strategic implications are closely tight together in practice and in academic research as well. Decision-making requires practices and tools for indicating operative performance in a meaningful way, and key performance indicators are helping in that (Olsthoorn et al., 2000). As authors Kaplan and Norton (2001) in their article suggest, linking key performance indicators correctly to measure strategical targets and choosing the right leading indicators is crucial task, which as its best can offer comparative advantage for the firm. However, the practice is often more complex and theoretical frameworks in performance measuring and practical implications are even as their best a set of compromises (Jordan & Messner, 2012). Otley (2009) address that even the academic research has its own shortcomings in finding coherent theoretical foundations for performance management literature.

2.2 WHY PERFORMANCE MEASUREMENT MATTERS?

One can ask what is the fundamental reason behind all the performance measurement? Why organizations are interested all kind of performance data and why is it so crucial? Measuring performance is in the heart of every business or organization where strategy or any decided specific target is a vital reason for firm's existence (Kaplan and Norton, 2001; Porter & van der Linde, 1995; Kaplan 1983;). Measuring financial performance is probably the most known company internal performance-measuring field where financial statement and balance sheets are concrete results of the processes. Measuring is providing information and data in

the form of financial statements, which leads to further practical actions in order to maintain the suitable path towards the goals (Dess and Robinson, 1984). Organizations follow their performance in order to track whether they are going to succeed or not and if they should execute correcting actions (Kennerley & Neely, 2003). If results do not indicate desired results, the management of the firm will have to adjust their operations or strategic goals and execute necessary correcting actions. Financial reports, as an example of performance data utilization, are used externally by shareholders and other third parties who evaluate the efficiency of the company. Without being able to provide information where the firm is standing currently and heading to, no investor would invest since they cannot assess the riskiness of their investment. Therefore, performance measurement for financial purposes is essential element and will also be in the future.

The balance scorecard presented in the previous chapter is a classic management tool where measuring performance is strongly connected to the continuous improvement practices in order to release the full potential of the organization. The underline idea in Balance Score Card is to connect primary operative indicators to the above level organizational indicators that finally leads to the highest management level goals and indicators, on the strategy level. As Atkinson with his colleagues describe (1997) combined, interactive performance measures and indicators should as its best work for self-controlling system which gives up-to-date information for the management board. According to Kaplan and Norton (1996) the vital role of measuring is to provide information whether the organization is driving towards decided strategic goals or not. Receiving information for to support the decision-making processes is one of the most crucial task of performance measuring practices.

There are several areas of management accounting where measuring performance contributes significantly. Malmi and Brown for examples studied how performance indicators can be built as a management control packet, which works for coherent management control system internally. Murphy et al. (1996) examined how performance measurement is vital for the success of entrepreneurs and small businesses and how measurement should be organized in those firms. Günther and Shepherd (2010) studied how performance measurement should be implemented into the long supply chains, measuring the efficiency of existing bottlenecks. As explained earlier, currently performance measurement practices are seen as a full-covering phenomenon that should be implemented comprehensively inside an organization. The integration areas are numerous.

Said in other words, internal performance measuring activities are information sources for decision makers how well the company is doing currently. Without being able to create data and statistics and without being able dig in the information and find the causality, there is no possibility navigate the company efficiently (Kusiak, et al., 2000). Ability to analyze current stage is essential for finding required development targets and projects. Since management and operative level are separated in big firms, managers cannot observe all events and processes by themselves and therefore they have to rely on performance measuring indicators and the provided data (Kusiak, et al., 2000). Numeric and non-numeric performance data is providing better understanding of the reality and building improved information base for the decision-making executives. Well-designed performance measuring practices can conclude information in a meaningful way and provide comparative advantages for any businesses, since organization can more easily and immediately react to possible changes in business environment or consumer behavior (Jordan & Messner, 2012). Information delivers by management control systems have power to be more accurate than individual observations by human organization members (Kusiak, et al., 2000). Nowadays decision support systems (DSS), systems gathering information and data from the production or service process indicators are in the center of any decision making process and management control practice.

3 INTEGRATING ENVIRONMENTAL PERFORMANCE MEASUREMENT

This chapter continues from the ground that previous chapter creates. From the accounting performance measuring practices and theories, this study continues connecting management accounting and performance measuring world to the environmental performance. While moving to the concept of environmental performance measurement, similar measuring principles fundamentally exist than in the traditional management accounting measuring theories and practices. However integrating environmental performance measurement with existing accounting processes brings with it additional, environment related issues. To add on the accounting performance measuring theories, this chapter focuses to present some of the most essential theoretical concepts from the field of environmental performance measurement. First forthcoming chapter will shortly introduce the concept of environmental performance measurement in broader sustainability context and then central principles of environmental performance measurement in theoretical context. An additional focus of chapter 3 is in the challenges of integration of environmental performance measurement and management accounting processes. For a motivation for the forthcoming pages, in order to understand the empirical research findings of this study it is recommended to pay a close attention to following literature view.

3.1 CORPORATE SUSTAINABILITY

While regulatory environment for sustainability issues are tightening globally, organizations are under pressure to improve their performance and come up with new competitive edges in new type of business environment (Krajnc et al., 2012). In order to improve environmental performance and cut negative environmental impacts, organizations and countries globally should address the concept and ideology of sustainability (Olsthoorn et al., 2000). Sustainability can be defined *"meeting the needs of the present generation without compromising the ability of future generations to meet their needs"* (WCED, 1987). For businesses, in environmental wise, it means that they should focus on improving their resource usage efficiency and minimize all kind of environmental pollution caused by their existence (Olsthoorn et al., 2000). To illustrate, this means improved, more environmental

friendly processing methods that require less energy and pollute less at the same time. While the regulative environment demand corporates to switch their direction, at the same time customers globally have started to demand and favor more sustainable products and services (Spaargaren & Oosterweer, 2010).

Measuring environmental performance is a key part of the whole sustainability assessment. Sustainability can be divided to three parts according to the Triple Bottom Line theory (TBL) (Elkington, 1999). These areas are economic, social and environmental. In order to achieve a sustainable stage, all these three parts should be highlighted and balanced. Elkington's TBL is probably the most used approach in corporate world for sustainability assessments and management. The underline idea in the corporate sustainability is that no firm can in the long run achieve its goal and go concern if they are not addressing the importance of the surrounding stakeholders. According to Elkington, ignoring those will create value-losses while being sustainable will in the long run benefit the organization and maintain its existence.

For assessing the level of corporate sustainability, multiple sustainability assessment models have been created in the academic literature. For example, Singh et al. (2007) created sustainability index framework (Figure 2) to evaluate selected companies in their research. This index includes five bigger sustainability-measuring areas: organizational governance, technical aspects, economy performance, environment performance and societal performance measuring. Under all of the areas, several individual indicators are measuring performances of the key performance variables. Individual indicators are selected to reflect the five main sustainability areas respectively. Combined analysis from the several performance indicators' results provides a complete sustainability assessment of the measured organization. The model can have a weighting for certain focus areas, highlighting the importance of required measuring areas, or equal weighting for all of the areas.

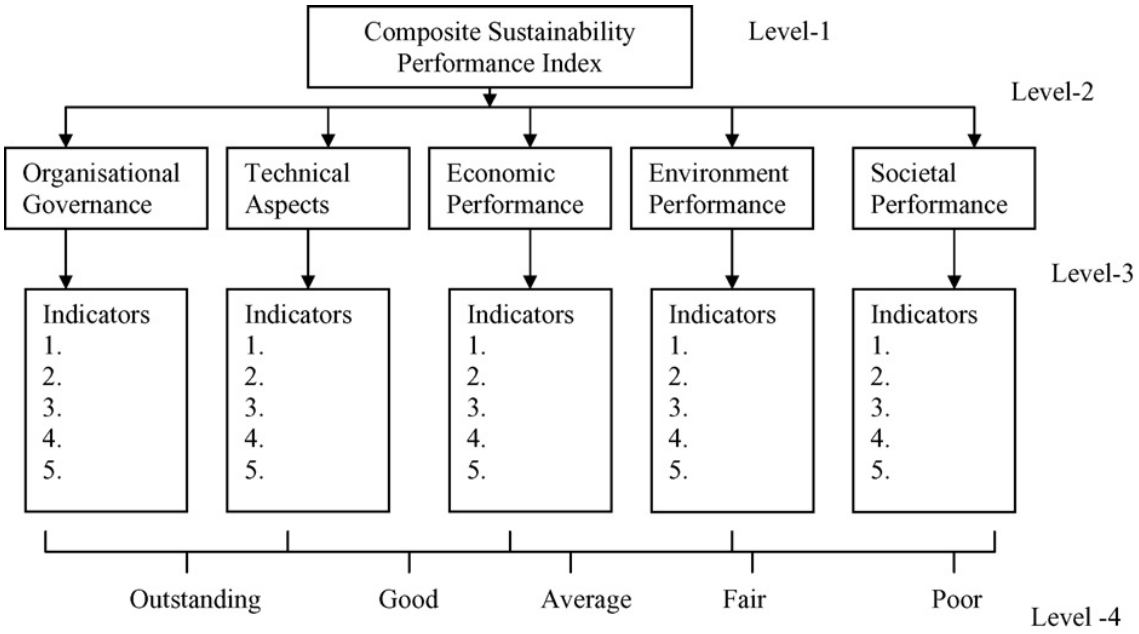

Figure 2. Sustainability Performance Index (Singh et al., 2007)

While the model is built for certain case, it sufficiently describes the broader measuring framework and principles of corporate sustainability assessment. Measuring environmental performance is a coherent field itself, but it is often connected to the other sustainability performance areas as well (Singh et al., 2007). According to the presented index, for example organizations' operative processes can be assessed under technical aspects (resource efficiency of processes), economic performance (cost of processes), environmental performance (eco-friendliness of processes) and societal performance (health dangers for employees in the operative processes). Since environmental issues are related to operative processes, it can be further concluded that environmental aspects are linked to all sustainability areas through the operative processes. This indicates that individual measuring areas simultaneously effect on the other performance areas as well, making the overall corporate sustainability assessment significant in order to successfully measure and manage the environmental performance as an unity.

3.2 MEASURING CORPORATE ENVIRONMENTAL PERFORMANCE

This chapter will go further from the sustainability framework to introduce more thoroughly the aspect of corporate environmental performance. While the research focus of this whole study is combined field of environmental performance measurement and management

accounting, before moving to that, reader must understand the concept of measuring environmental performance in the corporate context.

From academic perspective, challenges in environmental performance measurement and management are somewhat as strong as in the practical field (Singh et al., 2007; Blass and Delmas, 2010). Scholars have been debating over recent decades which areas should be included into the environmental performance measurement and what type of environmental measuring practices should be even implemented (Moneva & Ortas, 2010). For to come up with more commonly accepted, integrated sustainability assessment or environmental performance framework, there still are no consensuses among the scholars (Singh et al, 2007; Lee, 2011). Like Moneva and Ortas, most of the scholars even model their own evaluation frameworks for their assessments since no clear consensus of best practices exists. Through the last centuries, different institutions, including NGOs, universities and governmental institutions globally have been developing frameworks for environmental performance measurement frameworks. These frameworks include standards, guidelines, ideas, recommendation etc. for measuring, reporting and managing the environmental performance.

Environmental performance measurement and management includes several areas which makes building a unified corporate environmental assessment tool a challenging task. For an example, the one of the most widely accepted protocols, the GHC Protocol Initiative was established by World Resources Institute and the World Business Council for Sustainable Development in 1998, which tried to provide more suitable packet for the corporate usage (World Resources Institute, 2016). GHC Protocol is probably the most unified tool in the field of environmental performance measurement but even GHC Protocol is only focusing on greenhouse gasses, covering a small part of the field of environmental measuring areas. Regarding the GHC Protocol, earlier protocols which were not meant for corporate usage, faced a strong critic from the business world and were therefore often left behind without implementation (Andrew & Cortese, 2011). The aligning problems regarding the accounting and corporate practices were that past models were not build to be connected with normal accounting systems and practices. Previous protocols were also highly influenced by the organizations creating the protocols, highlighting the needs of certain organizations only. The GHC Protocal Corporate Standards was revealed again in 2004 which was conducted by multiple global private entities and governmental organization such as IKEA, Nike, Australian Greenhouse Gas Office, US EPA and WWF. The development path of the GHC

Protocol describes how considerable development environmental measuring models and initiatives require in order to be implemented in the corporate world. Even the most developed framework or standards in environmental performance measurement are still struggling to fulfill requirements for unified performance measurement practices (Andrew & Cortese, 2011). This creates broader challenges for organizations to assess and report their environmental performance (Andrew & Cortese, 2011; Lee, 2011; Gibassier et al., 2013)

Despite of the challenges towards environmental performance measurement, according to Ilinotch et al. (1998) measuring corporate environmental performance (CEP) was seen already before millennium a strategically significant performance area for multiple businesses however the practice area still maintained problematic. More recent research by Blass and Delmas (2010) tells the same story: overall sustainability measuring in the corporate world is *"... still in their early phases of development and are often contentious."* (pp.256). Despite of the challenges in creating global practices, the field of environmental performance measurement has only grown in the past years in academic research (Andrew & Cortese, 2011; Lee, 2011; Gibassier et al., 2013). Organizations and corporates who set their targets to reduce their environmental impact have to somehow identify how much they are currently polluting and utilizing resources, in other words, they have to measure their environmental performance. In the urgency to fulfill requirements Olshtoorn et al. (2000) emphases the risk that corporate environmental performance measurement and management are often linked to the larger framework of sustainability assessment and management, and often the implementation is left on the larger level.

In order to build more practical and workable models for CEP, adjusted frameworks for environmental management and performance measurement has initially been created (Calantone et al, 2002). Modern solution for arranging environmental performance measurement is implementation of an environmental management system (EMS). Environmental measurement system can be defined as the measurement of the interaction between business and the environment (Bennett, 1997). Olsthoorn et al. (2000) explain that EMS can be linked to "... *level of individual environmental performance indicators, the level of the overall performance measurement system and at the level of relationship of this system with the external environment."* (pp. 455). EMS's purpose is to provide more detailed tools for executing CEP in the operative level and strategy level and to ensure that CEP principles

will be implemented accordingly for more concrete systems and management principles (Olsthoorn et al, 2000).

As traditional business enterprise resource planning systems (ERP), EMS systems have a similar fundamental purpose. Ideally, EMS is integrated with the existing operative management systems (Calantone et al, 2002). As Calantone and his colleagues define EMS, it is a system that "*... involves the formal system and database which integrates procedures and processes for the training of personnel, monitoring, summarizing and reporting of specialized environmental performance information to internal and external stakeholders of the firm."* (pp. 332). EMS overall refers to a re-structured management framework that fulfills for example ISO 14001 principles and enables organizations to implemented environmental targets into the core operative control and planning functions. EMS is including the physical practices and operative management tools that are measuring the actual environmental performance and should be connected to existing control and planning processes (Olshtoorn et al, 2000).

3.3 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE MEASUREMENT MODELS

An example of corporate environmental management framework was introduced in the Fieldman's and Tibor's book (1996) where environmental management is divided to EMS and Life Cycle Assessment sides. This framework is based on the ISO14001 standard which was initially published in also in 1996. ISO14001 is an environmental management system guideline, including practical tools for improving the environmental management but also more managerial approaches and methods to engage environmental management firm externally and internally.

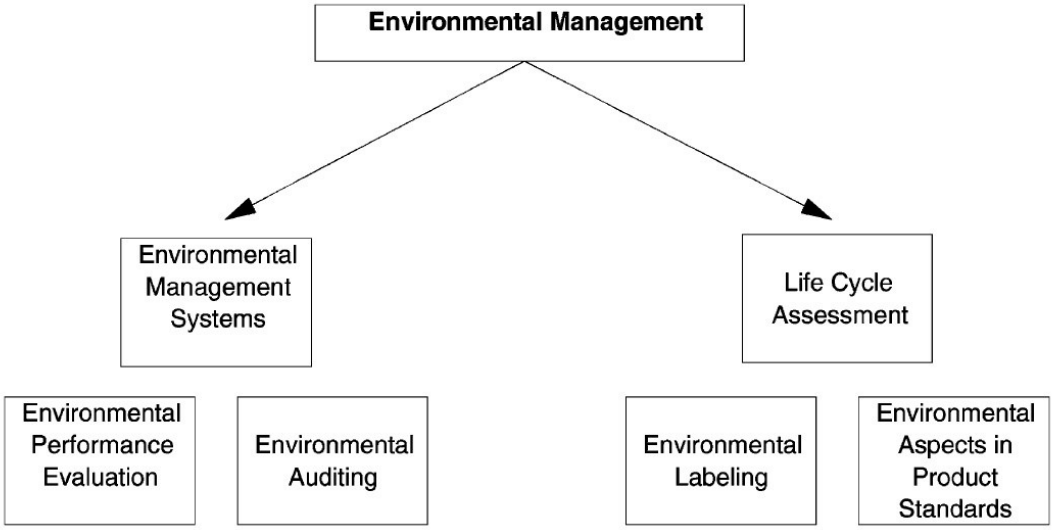

Figure 3 Environmental Management framework (Fieldman & Tibor, 1996)

After this theoretical framework was introduced in 1996 more modern models have been created and updated versions of 14001 have been published. However, in order to understand the environmental management as an organizational theory, Fieldman's and Tibor's model applies to this case study well. In Fieldman's and Tibor's model the split is done to two categories: (1) to EMS which measures the environmental performance of the organization's operative processes and (2) to the product life cycle assessments, which defines the environmental impact of the organization's outputs. EMS's purpose is to measure, control and develop this performance further (Calantone et al, 2002). To illustrate the need for comprehensively covering model, organizations can for example only focus to improve their EMS while their products and services are still left out without appropriate life cycle assessments, leaving a significant gap in the overall environmental and sustainability assessment of the organization. Therefore, deviation is needed in order to more deeply understand and assess the environmental performance of the organization's itself; its products' and services'; and its externalities.

To further break down the broader environmental management and measuring practices, more technical models have been developed for environmental performance measurement. Example of a modern environmental performance framework for modeling measuring processes is a presented by Kuisma (2016). Kuisma's model as well includes separation for products performance and operative performance. Additionally third aspect, the company's overall performance is added into the model.

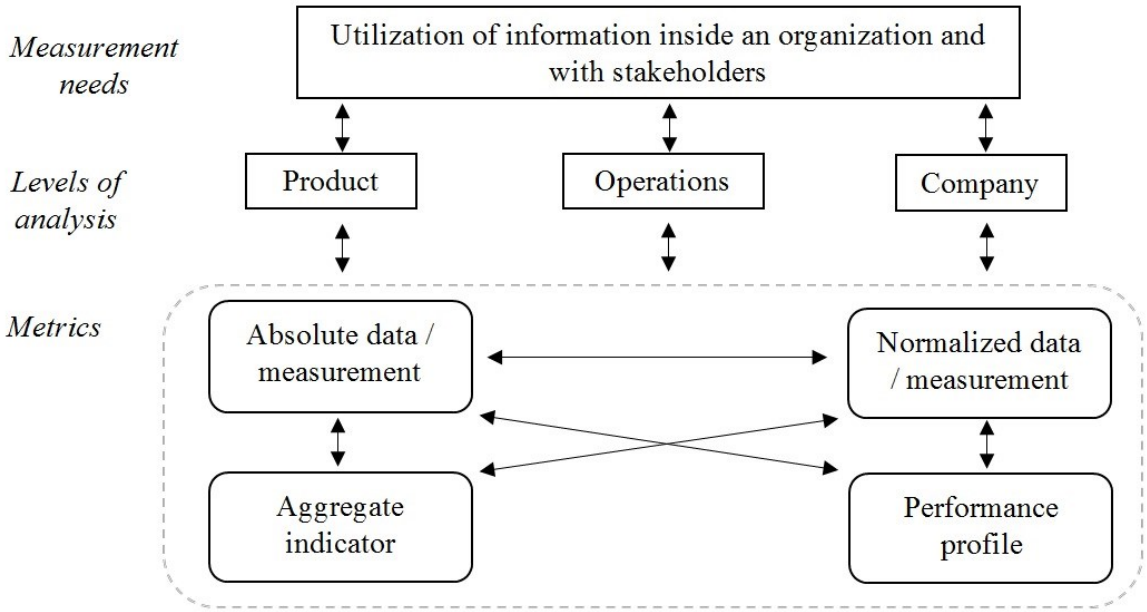

Figure 4, Environmental Performance Measurement Framework (Kuisma, 2016)

Kuisma's graph describes the different elements and their connections to each other's in environmental performance measurement. The graph is divided for three fundamental areas: Measurement needs; Levels of Analysis and Metrics. Measurement needs define which informative elements and gaps performance measurement practices should cover and for which purposes the information will be provided. Recognizing the fundamental drivers for the demand of environmental performance information can be a complex task (Kuisma, 2016). Environmental information can be required by several internal, but as well external stakeholders, and in many cases organizations don't even recognize the most potential utilization purposes for the environmental performance information (Olsthoorn et al. 2000; Burritt, 2004; Brörklund, et al 2012). To add on the internal usage requirements, different external stakeholders demand different information depending on their preferences and the form of information varies due to local legislation, local issues, and prioritized environmental areas (Niskala, 2013). This places further challenges for environmental performance measurement and information disclosure processes.

From the Kuisma's graph, in the level of analysis, the scope of environmental performance measurement should be defined. In the center of any performance-measuring project, creating boundaries for the measurement area is vital (Calantone et al, 2002). Measuring environmental performance of the company and relative processes can be relatively simple

from the technical level, however measuring product's environmental externalities can be too resource intense and consuming for organizations. Therefore, for performance measuring there should be defined which areas' environmental performance measurement should cover. While many firms are measuring their operational emissions and resource usage, they lack to measure the whole product life cycle impact covering all stages of the product, and in many companies, it is a rational managerial decision (Brörklund, et al 2012).

Thirdly from the Kuisma's model, in all performance related measuring the selected metrics and indicators play a crucial role in the success of the measuring practices (Calantone et al., 2002). Organizations have to identify their requirements for performance data and then pick the most suitable performance indicators to reflect the required information (Henri & Journeault, 2007). In the success of environmental performance measurement, indicators are the actual practical tools that measure the performance, where rest of the whole process is just assessing and gathering the information. Nevertheless, if the indicators fail to follow the reality, whole process turns out to be useless (Sikdar, 2003). To utilize the collected data for analytical processes and to support decision-making, it is crucial task where many organizations fail (Lee, 2011).

3.4 LEVELS OF CORPORATE ENVIRONMENTAL PERFORMANCE MEASUREMENT

The actual environmental performance measuring is most often linked to the several organizational levels. In order to fully utilize the benefits of the environmental data and measuring practices, the integration between different levels and tasks should be ensured in the environmental performance measurement (Burritt, 2010). Integration of different levels creates level specialized tasks for different organizational groups, which support more largely EMS and other environmental performance measurement purposes. To enlighten this, Olsthoorn et al. (2000, pp. 454) in their paper provided below demonstrating example table:

Different users and functions of environmental indicators inside and outside the firm

User/decision context	Function for the user
Corporate manager	To monitor a firm's "environmental" development in relation to strategic targets (derived from concern about future impacts of environmental developments) To identify most harmful wastes and emissions [38] To communicate corporate environmental performance/attitude to stakeholders (shareholders, environmental authorities, clients) Reference performance in preceding periods/years
Production plant manager	To identify opportunities for improvements of efficiency To convey information on the efforts to limit environmental impact of plant operations
Market manager	To identify new market opportunities To defend market positions; reference point competitors
Purchasing manager	Accountability; business-to-business relations
Environmental authorities (compliance situation)	To test compliance of firm with permits
Authorities (national)	In voluntary agreements; communicating a firm's effort to environmental improvement Useful for constructing databases that are helpful in developing and implementing a government's environmental policy
Investors and shareholders	Indicator for financial performance May indicate environmental liabilities that could affect a firm's financial performance
Consumers	To meet needs of green consumer

Figure 5, Functions of environmental indicators (Olsthoorn et al., 2000, pp. 454)

The above example is not exhaustive but it illustrates possible levels and tasks that environmental performance measurement can in practice include. In every level, the chosen and integrated metrics and indicators measure environmental performance, providing information for the decision making and control processes (Olsthoorn et al., 2000; Calantone et al, 2002).

Regarding the selected metrics, as Singh et al. (2007) defined, measuring criteria and indicators are primary requirements for successful environmental performance measurement and the selected indicators should be measuring as closely as possible the essence of identified environmental issue itself. More specifically, selected metrics are called environmental Performance Indicators (EPIs). Measuring indicators can be divided to two groups: content indicators (explain the state of the system) and to performance indicators (measuring the performance of the system) (Sikdar, 2003). For example, presented Kuisma's model (2016) is including normalized and absolute data indicators, aggregate indicators and performance profile. While data indicator are using data to evaluate performance, the actual performance indicators are measuring the actual phenomena. However, both ways are in optimal stage used simultaneously to draw a completely picture of the environmental performance and its stage (Kuisma, 2016)

Like traditional management accounting and performance measurement practices, EPI and environmental management are also suffering the problematic nature of standardization: while firms vary between each other's so does their surrounding environmental reality which effects on the measuring practices and solutions (Olsthoorn et al., 2000). Even though the connection with traditional operative performance indicators is relatively strong, the empirical research available is still quite rare (Henri & Journeault, 2007). According to Illinets et al. (1998) EPIs should be focusing to measure internal, external, process and results aspects. These four categories describe how multidimensional environmental performance measurement is and how broadly EPIs can be implemented to measure different aspects of the environmental performance. Hence the number of interaction points where firm existence is influencing on environment is significant and even recognizing all of these points is challenging task for every organization as presented in previous chapters (Henri & Journeault, 2007)..

Despite of the challenging measuring environment, EPIs usage is becoming more and more common in the practice field (Said et al., 2003). To add on, Henri and Journeault (2007) conclude, managers should be aware that usage of EPI *"... (i) support and communicate the environmental strategy throughout the organization, (ii) support and ensure conformity of environmental processes helping organizations to obtain and maintain the ISO 14001 certification, (iii) formalize complex environmental processes and procedures, (iv) decentralize and support environmental information systems and (v) contribute to meeting stakeholders' expectations"* (pp. 147). EPI measurement practices can be seen as a technical installation of EMS systems, giving environmental targets a concrete form of executed practices. To add on the previous, currently mitigating environmental risk and managing environmental impact are becoming even more significant aspects of EPI measuring (Arena et al., 2010). As traditional performance indicators, environmental performance indicators can provide significant data and information to the decision making and without indicators it would be relatively difficult to assess the environmental performance of the organization, despite of the usage purpose of the information (Henri & Journeault, 2007; Sikdar, 2003).

3.5 INTEGRATING ENVIRONMENTAL PERFORMANCE MEASUREMENT AND MANAGEMENT ACCOUNTING

Environmental management theories are becoming increasingly important in management accounting research (Lee, 2011). From theoretical perspective management accounting and environmental performance measuring have been a long time relatively unknown research combination, however, Gibarries et al. (2013) as well indicated that environmental management accounting has become significant management accounting literature field at the beginning of 2010 decade. Some of the observations still show that EMA literature is not mainstream yet, but the number of publications is constantly growing and the attention received is increasing.

Regardless, accounting literature is still debating whether environmental performance measurement is even a reasonable practice to be connected with accounting processes or not (Lee, 2011). Nevertheless, several authors have examined and discussed in favor of implementing environmental management accounting practices (Henri & Journeault, 2007; Calantone et al., 2002; Moneva & Ortas, 2010; Burritt & Schaltegger, 2010) to support the decision-making by providing additional, but critical information. From critical approach, scholars have argued that accounting practices are not able to disclose environmental or sustainability related information and should not even try to do so since there are no value adding results examined (Gray & Milne, 2002; Aras & Crowther, 2009; Gray & Milne, 2012). Some scholars have stated that even evidence of better economic performance due to improved environmental management cannot be proved (Henri & Journeault, 2010) while other authors have proved opposite (Ameer & Othman, 2012). Whether the practice is being proved to be successful or not, environmental performance measurement is moving closer to be integrated with the traditional performance measurement practices due to internal and external pressure forces (Moneva & Ortas, 2010; van Beurder & Gössling, 2008).

Despite of the missing consensus in many areas, management accounting and environmental performance measurement do have a natural relationship with each other's (Calantone et al, 2002; van Beurder & Gössling, 2008; Ameer & Othman, 2012). Environmental performance measurement has several overlapping roles with traditional management accounting. These are i) monitoring compliance, ii) to motivate continuous improvement, iii) provide data and

information for decision-making iv) and provide information for external reporting (Henri and Journeault, 2007). As discussed previously in this paper, in organizations accounting departments and accounting professionals have traditionally been involved into performance measurement practices (Burritt, 2010). Controllers and accounting personnel have been given the responsibility of planning, implementing, controlling and managing performance measuring practices. According to Caliskan (2014) accounting information systems are fundamental monitoring systems, which provide and evaluate the information for corporate activities and accounting systems should as well be able to evaluate environmental performance information. Since accounting specialists have had strong role in measuring and data collection processes, accounting information systems will act as a central role of measuring organizations' environmental performance as well. As Calantone et al., (2002) suggest, environmental performance management and measuring is playing crucial role in overall firm performance management and its importance will most likely only increase. In the modern sustainable business context, EMS, with correct environmental performance indicators (EPI), creates specialized data of the significant performance areas and together with traditional accounting information improve organizations ability to response environmental performance issues accordingly (Henri & Journeault, 2007; Burritt, 2004). According to more recent study by Henri and Journeault (2010) mangers should pay attention integrating environmental measurement practices into the existing management control systems, which are also linked to the management accounting practices.

According to several authors (Andres & Cortese, 2011; Burritt & Schaltegger, 2010; Arena et al., 2010; Cuthbertson & Piotrowicz, 2008) activities for measuring sustainability and environmental performance, new type of activities, are taking place in organizations throughout multiple departments and functions. For accounting as a practice in organizations, this means that accounting and accountants are currently involving more and more to the disclosure of environmental and social information, getting more involved with the sustainability issues (Cuthbertson & Piotrowicz, 2008). Accounting as a function has always been in the center of information processes and systems, and hence managing sustainability among environmental performance measurement in the organization is nowadays closely related to accounting functions as well (Burritt & Schaltegger, 2010).

Integration between environmental performance management and traditional management accounting is called environmental management accounting (EMA). EMA became a visible

concept in the management accounting during the 1990's (Burritt & Schaltegger, 2010). Initially EMA was developed to provide appropriate mechanisms that assist in the identification and allocation of environment-related costs (Bennett & James, 1999), but nowadays EMA is even more trying to disclose as well non-financial environmental performance data that helps organizations mitigate their long term risks that can cumulate as a financial, operative or stakeholder risks (Man & Vasile, 2012).

According to Association of Chartered Certified Accountants (ACCA, 2016) EMA *"is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes."*. EMA is a framework that has been developed to provide a broader management concept for organizations, including practical accounting process models and tools to measure, gather and analyze environmental performance information. Burritt's (2004) definition of EMA takes the definition a bit further: "…*EMA is concerned with the accounting information needs of managers in relation to corporate activities that affect the environment as well as environment-related impacts on the corporation."* (pp. 13). This definition reflects well the duplex role of EMA: while firms are required to measure their impact to the surrounding environment due to stakeholder demands and regulatory reasons, firms also want to measure and manage the environmental risks that might cause downsides or limit their own possibilities. Hence, the demand for EMA is arousing internally but as well externally.

While EMA itself is a wide concept, it includes significant practical elements where measuring the environmental performance, as a business leading indicator area is significant. As multiple authors have explained non-financial measures have gained more attention especially in strategy context (Rockart, 1979; Kaplan & Norton, 1996) where environmental indicators are essential part of the future management control systems in operative management as well (Burritt et, al., 2011; Man & Vasile, 2012). Environmental information is becoming crucial in many ways, leading to the stage where firms are starting to realize the urgency to address importance for key environment performance indicators. Overall sustainability indicators are currently getting more understanding as companies have started to understand their significance in economic matters as well (Singh et al., 2007).

Despite of EMA's focus on improving organization's environmental impact and management, EMA principles provide further guidance for firms to assess their resource inputs, waste and

emission outputs in cost wise. EMA can work as a control system which isolates and quantifies costs, benefits and operational outcomes of proactive environmental management (Lee, 2011), but in order to do so EMA must be able to measure usage and flows of materials and related monetary information accordingly (environmental costs, benefits and savings). EMA can provide in the optimal situation improved methods for operative measurement practices and for operational management with environmental focused approach. Man and Vasile (2012) in their article list areas where environmental management accounting influences. These are planning of processes and products, the allocation and control of costs, capital budgeting, supply processes, price policies and performance evaluation. Thus EMA can contribute to numerous operative processes.

Despite of operative nature, EMA also has a strong association with firm strategy as Christ and Burritt (2013) in their study examined. Increased need for more environmental friendly products and services with more strained environment regulatory push organizations to implement environmental values in to their core strategy goals. Therefore, environmental management accounting becomes involved as a concept in broader meaning inside the firm. Modern EMA practices can fulfill strategical characteristics that control and guide all actions of the organization. As Porter and van der Linde (1995) in their study concluded, environmental regulations and new internally developed practices can create innovative solutions and reduce operative costs due to minimized energy and resource usage. While environmental and more broadly sustainable thinking take place in the organization, it can create innovative pressure and further improve organization's ability to adapt sustainability into their core organizational consensus. EMA is not only focusing on environmental approach, but also for direct strategic business benefits, in the same way as Porter and van der Linde in their research explained.

3.6 PRACTICAL EXAMPLES OF ENVIRONMENTAL MANAGEMENT ACCOUNTING

This chapter introduces two examples, Life Cycle Assessment and sustainability reporting, how EMA and environmental performance measurement practices are visible in organizations. Examples are opened through theoretical models and prior empirical research.

3.6.1 Life Cycle Assessment

For normal performance data utilization, over the recent decade framework of life cycle analysis has proved to be a prominent tool for allocating information in the way that its creating new information and supporting decision making (Woodward, 2007). The most well-known practice for life cycle analysis is the Life Cycle Costing (LCC) where all direct and hidden costs and intangible aspects over the products existence period, are combined and analyzed as a whole (Aoustina et al., 2007). The main target has been to improve the usage of resources for to minimize expenses and resource usage and therefore to improve the businesses' profitability (Woodward, 2007).

For environmental performance measurement purposes, a more developed model from LCC was eventually created. As Aoustina et al. (2007) defined; aligning principle in LCA is that environmental impacts, such as carbon footprint or material resource usage of products or services should be calculated by investigating the whole life cycle of the product or service. Gauthier's (2005) definition is that LCA is trying to take into account all possible steps from the product cycle and assess those impacts to surrounding environment within same framework as normal LCC, but just giving more focus on environmental impacts. In so said, in the light of LCA, organizations are trying to recognize and assess all possible steps of the life cycle and those effects to the surrounding environment. LCA includes non-financial assessment but also financial side as well, making the LCA a more accounting related numerical practice (Andrew & Cortese, 2011). While the key is to improve environmental performance of the whole life cycle, LCA also focuses to mitigate costs of the life cycle while focusing to do it together with improved environment performance targets. Currently new type of LCA, Life Cycle Sustainability Assessment (LCSA) is becoming more popular (Kloepffer, 2008; Buonamici et al., 2011). LCSA is trying to provide more wider perspective for LCA analysis, taking into account full scope of sustainability (people, planet and

prosperity) instead of more narrower LCA which is mainly focused on the direct environmental impacts of the value chains. However this study is discussing mainly LCA, since the difference between LCSA and LCA is not the focus point of this study. To summarize, LCA is including environmental aspects but relating financial analysis as well, hitching these two dimensions into consideration of one analytical tool (Kloepffer, 2008).

Traditional life cycle analysis has been executed by accounting professionals and thus environment focused LCA is becoming more visible in accounting functions (Andrew & Cortese, 2011). LCA is gathering information from all possible steps throughout the value chain, while the main idea is to figure out some of the key resource inputs and outputs of the production:

- Consumption of energy *(all possible forms)*
- Consumption of raw material *(all required raw materials and semi-finished products)*
- Consumption of water (*process waters and product required water)*
- Production of polluting agent, *(direct and indirect emissions from all processes)*
- Production of toxic products
- Production of waste *(all kind of materials streams that cannot be utilized by own processes or to be sold for third party usage)*

Some of the variables have a direct financial expenditure for organizations since organizations have to pay for used resources. Some of the measuring areas are causing indirect expenses, such as increased environment risks due to polluting processing methods. To mention, CO2 emissions are nowadays even direct emissions for companies since in multiples countries companies are obligated to buy licenses either to allow C02 emissions or pay compensation for governance according to emitted emissions (Ekvall, 2008).

Following Figure 6 describes the process chart of the product lifecycle system. In each stage certain inputs are required for the production process that increases products life cycle usage of energy and raw material. At the same time, all stages create environmental impacts, outputs, in waste streams and emissions which can be measured with selected EPIs. Evaluating the complete lifecycle impact is including all these outputs and inputs.

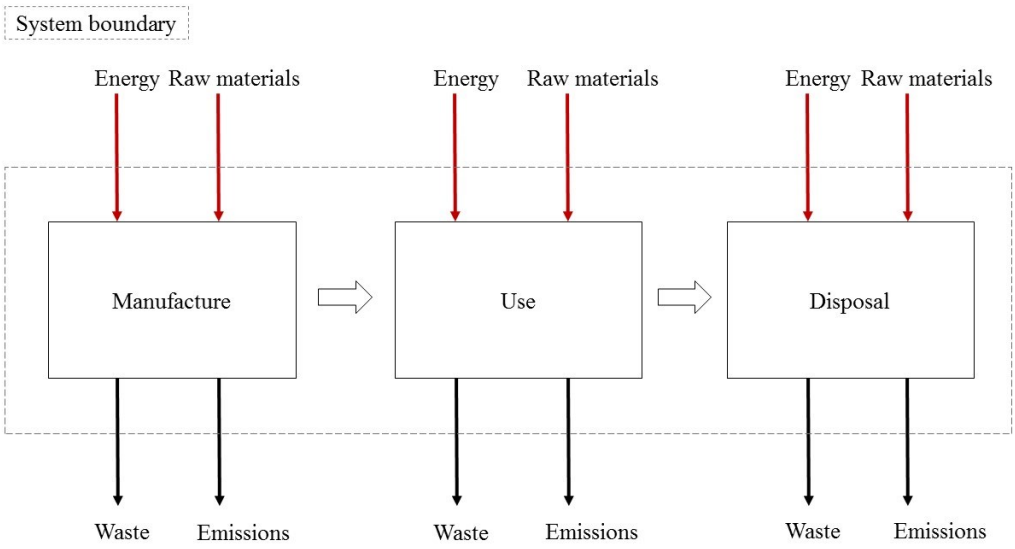

Figure 6, LCA model

In order to be able to allocate and provide data accordingly for LCA analysis, sophisticated accounting information systems are required (Henri and Journeault, 2007; Henri and Journeault 2010). Traditional life cycle cost analysis is able to measure material in and outflows, but the environmental performance measurement requires more further developed methods (Andrew & Cortese, 2011). In some products, environmental impacts are more far reaching than the cost analysis. For example, in assessment of producing a regular car, normal LCC analysis will show significant cost expenditure during the production phase. LCA on the other hand will also focus on the user-phase of the car where most of the pollution is occurring. To successfully execute LCA, the knowledge of process related accounting practices and allocation must discuss together with the environmental data created by EPIs and EMA practices. As Henri and Journeault (2007) explained, in the center of environmental performance measurement are selected indicators, which are essential for EMA and LCA assessments, since indicators are the tools to understand and describe reality.

To give an example, in the article by Gironi and Piemonte, (2011) the overall sustainability of the new biomaterial in plastic bags was assessed by using LCA to give a coherent picture of the whole life cycle resource consumption and environmental impact. Even though the bioplastic bag is more environmental friendly, the production of bio bag required six times more electricity than normal plastic one. However, in LCA the usage of resources and environmental impact in total was further evaluated, leading to the conclusion that in

eventually bioplastic bags are with advanced production methods almost as energy efficient to produce than plastics bags. However bio bags impact to the surrounding environment is less harmful than plastic bags, giving a better overall LCA evaluation for the bio bag over the plastic one. By the conventional LCC approach, normal plastic bag would be more favorable option, though LCA is including more coherent environmental approach leading to the more favorable results for the bioplastic bag. Without LCA framework it would be severe to assess which processes, materials or products are more eventually more environmental friendly than other methods or products.

Justification for LCA is simple to find since environmental aspects have a clear cost expenditure effect. Traditional reason for firms to measure their environmental impact is a need for reduce operative costs (Henri & Journeault, 2007; Andrew & Cortese, 2011). Even though EPIs relevance is often justified in cost reduction targets, EPIs are essentially valuable for environmental performance measurement practices in multiple other ways, such as in marketing communication (Said et al., 2003). Decreasing the environmental pollution and resource usage goes often hand in hand with the need of cut operating cost, where applying LCA can eventually lead to win-win situation where firms can benefit from focusing on externalities of their existence (Said et al., 2003).). Seeking for less polluting options can create innovations that also improve firms' operational efficiency and therefore reduce operational expenses (Schmidheiny, 1992; Moneva & Ortas, 2010). According to Finkbeiner et al. (2010) LCA practices for example can assist companies to realize the broader sustainability approach and to improve companies capability to react and report. Environmental performance measuring practices and principles thus require further development.

Ekvall (2008) concluded that for reaching environmental emissions reduction targets, it is more efficient to incentive businesses in cost wise, than building up new environmental regulative policies. Ekvall stated that governments should globally more heavily tax polluting manufacturing methods and on the other hand give tax reliefs for environmental friendly products and processes. In the process of track down the environmental performance, LCA provide suitable solution for organizations. Without coherent LCA and EPI practices, organizations are unable to evaluate their environmental impacts and response to the new regulatory demands. New type of integration between accounting practices and environmental

measurement principles are required in the future where EMA provides via LCA principles a solid base (Moneva & Ortas, 2010; Andrew & Cortese, 2011)

3.6.2 Sustainability reporting

Another concrete output example of environmental performance and accounting are corporate sustainability reports that companies in a growing number disclose to supplement their annual reports (Gibassier et al., 2013; Abrahamsson et al., 2012; Niskala 2013). Sustainability reporting is a voluntary activity consisting two main purposes: firstly, to reveal the current sustainability stage of the firm for stakeholders and secondly communicate and document firm's efforts and targets of sustainability acts (GRI, 2016). Sustainability reports were initially emerged due to need of stakeholders to receive information of organization's sustainability performance.

Sustainability reports provide for companies a possibility to open their performance in economical, societal and environmental wise. Environmental results include environmental performance information and other written assessment of the organization's environmental impacts. Traditionally this has included GHC emissions and energy consumption and additionally other written assessment regarding organizations current environmental stage and the future improvements (Lozano & Huising, 2010). Sustainability reporting can be seen as an end-product of EMS and usage of EPIs. In order to provide environmental performance information for the reporting, measuring practices have to exist accordingly indicating that actual reporting requirements, whether internal or external, shape the procedures of actual measuring practices (Hák et al., 2011). Traditionally organizations have collected environmental performance data and conducted those for the sustainability reporting (Niskala, 2013). For the investors and other external stakeholders sustainability reporting, including environmental performance data, works also as benchmarking information against other entities (Lozano 2013; GRI, 2016).

The consulting firm KPMG made a survey in 2015 including 4500 firms globally. As it seems, sustainability reporting has become more popular over the recent decades: in 1993 only 14% of companies in the survey disclosed sustainability report and in 2005 already 41%. In 2015 KPMG made a survey of world's 250 biggest companies where respectively 93% of the firms disclosed corporate sustainability report. However, in the report (2015) authors

conclude that further emphasis has to be paid on the quality of the reports and especially the visibility of the information. The report also state that sustainability reporting is also suffering from lack of standards while global reporting don't have any formal, required format. For future trends the report mentioned sustainability reporting to be integrating more closely with firms' annual reports and therefore becoming central element of the annual reports it selves.

Current sustainability reporting receive critic as well from academic world. Gray and Milne (2012) point out that current sustainable measures are focusing only in the entity itself and not highlighting the broader externalities, making the sustainability reporting dangerous tools since it guides organizations to focus too narrow area. Environment performance measuring in companies is built to focus to measure local impacts, but on the national level assessment is missing (Hák et al., 2011). Lozano and Huising (2010) argued that in order to improve sustainability reporting, more holistic approach should be taken which includes stronger long time horizon, indicating that current sustainability reporting is as well too time focused to current moment and short-time impacts.

3.7 INTEGRATION CHALLENGS

This chapter will present some of the most dominant challenges related to successful integration of environmental performance measurement and accounting processes. While environmental performance measurement itself is a technical process, this chapter will exclude technical measuring problem setting since this study focuses on the environmental management accounting and related performance measurement issues, not on technical measuring issues.

However, for the reader it must be explained and reminded, measuring environmental impacts include technical issues as well, and those should not be underestimated since they effect on the integration of environmental performance measurement as well. As explained in previous chapters, it is almost impossible to measure completely and fully all of the environmental impacts of a company since the concept of externalities can always be broaden to cover more and more environmental impacts. Despite that, accounting practices and culture related issues and challenges play a crucial role in businesses' environmental accounting and performance measurement, and possibility to affect on these is existing.

3.7.1 System and process related challenges

System and process related

Firstly, related to the physical processes and systems, one fundamental issue must be addressed. Even though environmental performance or environmental management accounting are not strongly related to contingency theory (Parker, 1997; Burritt, et.al, 2011), the theory explains some of the biggest problems towards integration of EMA practices and environmental performance measurement. Contingency theory is organizational theory stating that there are no unified best management practices existing. Organizations are always shaped by different stakeholders, culture, size, industry and geographical location and therefore in order to find the best methods, organization must be able to adjust within limiting constraints (Hofer, 1975). To integrate environmental performance measurement into accounting processes, this means that in order to work efficiently, the integration should be adjusted accordingly to reflect effecting factors of the firm's operative environment. According to Caliskan, (2014) countries differ greatly among each other due to their unique business environment that creates different conditions for companies to accommodate. Surrounding business environment is shaping the structure of the organization and how environmental performance measurement can be arranged and eventually integrated. Internally values, goals and organizational culture for example are influencing how willing and motivated the organization is for environmental performance measurement.

For example multiples authors have explained how firm's strategy has a crucial influence on how environmental management accounting practices are built and implemented in the organization (Parker, 1997; Bouma & van der Veen; 2002). In terms of EMA and environmental measuring practices this means for example that in certain industries, the pressure from external parties are creating more constraints and thus pushing organizations towards further improvements in environmental performance than compared to organizations that are less intensive in usage of natural resources, for example consulting firms (Bititci et al., 2012). This require from integrated environmental performance measuring practices as well different approach reflecting the external and internal information needs.

The great challenge in the environmental accounting and integration of performance processes is the large scale of different used methods and principles. Since individual countries demand or do not demand local firms to report certain multiples, the routines of measuring environmental impact varies over firm to firm and country to country. Varying performance measuring results generate indifferent data and especially incomparable measuring practices. Since one fundamental precept of accounting is comparability, the environmental accounting is still suffering from very basic problems. As Henri and Journeault (2007) concluded, EPI and EMA theories and practices are still lacking of standardized solutions which could unify the practices and used tools. The problem relies in the aggregation of metrics and indicators, where unifying global sustainability assessment, environmental areas among them, is a challenging concept due to nature of the sustainability issues themselves (Keeble, 2003; Bennett & James, 1998). As best practices vary between industries and geographical areas, the variation arouses problems to a trustworthiness of the data. Information collecting indicators should by principle be adjusted to process in the same way, or otherwise data became incomparable (Keeble, 2003**)**. Without harmonization of indicating practices and execution the data itself becomes useless and worthless (Hopkinson et al, 1999). Without comparability between data and sources, the comparison technically becomes too complex and the relevancy of information and data decreases.

For EMA this indicates that best practices may exist within a certain firm or industry, but may not be transferrable to other business environment. This causes practical issues for EMA and environmental performance measurement research and implications. As Saarinen (2003) addressed, recognizing and implementing the best practices become impossible if there are no possibility to compare different practices and evaluation of organizations' sustainability is impossible without benchmark possibility. All companies are unique in their own boundaries and constraints and hence the environmental performance management should optimally be customized individually for each organization.

Secondly, related to the formal processes and systems, poor EMA practices and integration to existing management accounting is one of the biggest system related challenges. As explained being able to adjust environmental performance measurement practices to be suitable for your own organization is vital, but so is the actual implementation work as well. In the study of Irish medical manufacturers and normal power plant stations (Jones et al., 2009) researchers

ended up with conclusion that being able to measure emissions accurately, development of accounting processes is vital. They found that accounting processes should be linked in a meaningful way to environmental performance indicators so that the system ensure flow of the information. Several authors have explained and suggested that EMS and EMA processes should be implemented as an integrated process of organization's performance management structure (Porter and van der Linde 1995; Andersen and Fagerhaug, 2005; Tsai and Hung, 2009). As Olshtoorn et al. (2000) emphases the risk for poor practical implementation is real, since many companies fail to adequately integrate environmental performance measuring processes, making it separate function, which does not sufficiently discuss with the existing accounting processes.

As Bertels et al. (2010) in their guidebook explain, sustainability and environmental management should be aligning vertically throughout the whole organization instead of leaving it flowing next to core business. This involves integration to the existing management accounting and environmental performance measuring processes. To add on, Cuthbertson and Piotrowicz (2008) found in their study that even though linkage between different hierarchical levels and performance indicators were often recognized and understood to be crucial for decision-making, this did not apply for environmental indicators. EMA is likely to be more successful when the organizational structure supports cross-functional cooperation and communication between different managers (Bartolomeo et al., 2000; Bennett and James, 1999). Similar findings were found by Lee (2011) who found in many firms' implementations of EMS to be poorly made and isolated from other decision-making systems. Reasons for these were in most cases either poor technical knowledge to connect environmental performance indicators into the existing management systems or lag of commitment to environmental goals or both at the same time. The knowledge regarding the practical implications and benefits are still missing and multiple company's struggles linking the environment performance indicators, the created data and the decision making all together.

The problem of appropriate systems and commitment is a problem with the supply chain performance analyses as Brörklund, et al (2012) pointed out. Ensuring all relevant parties to be committed for measuring environmental performance is boundary itself for the value chain analyze. Major part of the environmental issues in the whole chain can be found from the beginning or the end of the cycle. In multiple chains, one firm does not control all stages of the life cycle chain, but there can be hundreds of firms. As discussed previously, measuring

products' or services emissions and environmental impacts firms should include their suppliers, distributors, retailers and end users in the environment performance analysis. Products itself may turn out be with new technologies less fossil resources requiring but the actual energy usage for to process the good might over take the possible benefits.

Data utilization

One essential problem of modern data collection is the problem of recognizing the correct data and to decide what data to analyze. As Brörklund, et al (2012) in their study noticed, organizations do understand the necessity to collect the environmental performance data but they lack to decide or recognize how to benefit from the data. The problem is somewhat similar to the normal performance data utilization, reminding earlier findings as multiple authors have shown in management accounting studies (Rockart, 1979; Kaplan and Norton, 1996; Olhstroon, 2007) and environmental management related studies (Porter and van der Linde, 1995; Henri and Journeault, 2007; Bertels et al., 2010). Especially decision making is often harshly connected to the data analyses and gathered environmental performance data may be left out from the decision-making processes. In the context of environment and social sustainability areas, measuring and decision-making become even harder since indicators should be able to collect and pack data from several sources and try to create a linkage to value creation.

For the management of the firms and environmental specialist, it is critical to decide how the data is processed and which indicators will have a central role in environment management plans. This often is defined by the organizations own primary focus. Some corporates might actually implement the environmental targets as their primary strategic goal where following EPIs become central. According to Lee (2011) many firms claim some environmental activities but systematic and comprehensive utilization of data is not implemented. Lee also found that existing accounting systems are causing barriers to further usage of environmental data, where systems have been built to focus on more traditional operative measurement practices. In many cases companies are first profit maximization units where environmental targets can play a crucial role, but environmental management is still judged by cost reducing arguments. In country level preparation of new environmental regulations this has been noticed already and EU commissions for example is planning to implement union wide tax for CO2 gasses which builds on financial incentive for corporates to reduce their carbon emissions. As Lee explained, if there are no real need for environmental performance data

utilization, the data becomes meaningless, and the integration between accounting processes and environmental performance measurement will not be executed appropriately.

3.7.2 Organization and behavioral related challenges

While physical structures and performance measuring practices show significant need for development in order to fix some of the main challenges, so do organizational and behavioral factors as well. In many organizations, employees and management are the problem itself, not the EMA systems or the environmental performance measuring practices.

Multiple studies have highlighted that significant problem area for integration of environmental performance measuring is the organizational attitudes and commitment towards environmental issues and measuring practices (Brörklund, et al 2012; Lee, 2011; Bertels et al., 2010; Burritt, 2004). A study by Raggi and Xhao (1996) found that negative attitude of accounting professionals influenced the quality and importance of environmental reporting externally and internally. While the reporting was found to be the crucial victim of the negative attitude, they pointed out as well that this affected to new investments approval processes if they were justified with environmental targets. By the same research majority of accountants agreed the importance of environmental improvements, but only 40% were actually implementing environmental approach to their working habits. Even though the study is from 1996, it proves well the fundamental issue of environmental practices inside firms and how people's own commitment and attitude are shaping the actual practices. Poor commitment and interest towards environmental targets, will reject the usage of available information.

Regarding organizational challenges Bertels et al. (2011) explained the main characteristics in creating a suitable organizational behavioral base for environmental management. They list engagement, signaling, communication and talent managing as key elements of creating environmentally orientated organization. Firstly, engaging includes educating people to know about environmental management and issues, challenging them to come up with new ideas and suggestions and linking suitable issues to the individual levels. By motivating employees to consider environmental issues, they start to take part in the environmental management as well. As Kaplan already in 1984 in his research paper stated: "*The option to include*

nonfinancial measures in the firm's planning and control system will be more unfamiliar, more uncertain, and, consequently, less comfortable for managerial accountants." (pp. 393) Pushing accountants to move towards the nonfinancial environmental performance field is creating a strong barrier inside the accountants. For the development of the environmental performance measurement and successful integration, engaging accountants into the environmental performance measuring processes is highly essential.

Secondly, Bertels et al. suggests signaling by actions that the entire organization is moving towards created goals. This includes changes in practices but also in strategy that signals the significance of the change. Without showing the change with practical actions the organization is not willing to follow the management or even able to do so. Organizations must create guidelines that includes environmental performance measurement clearly in the plan and has a clear value creating role and mandate. Thirdly, firms have to communicate with their employees about the environmental issues and listen the organization members. By letting everyone to question and argue towards the changes helps them to create together a shared motivation.

Lastly, the talent managing is crucial. Leading professionals from environmental management side together with the accounting and control professional may not be simple. Hence, for the successful integration, it is vital that these two groups are made to collaborate and their knowledge is tide for organizational usage and utilization. In the center of the challenge is how these two groups understand the concept of environmental performance measurement and management. While accounting professionals investigate these issues through their own background and knowledge, people with sustainability background or education often have a completely different experience field and education. Measuring environmental performance require input from several aspects such as environmental specialist, business controllers, performance measure specialist and management. While measuring practices are natural for accounting personnel, understanding environmental issues and their nature require knowledge from environment professionals that leads to increased need for co-operative processes between these two groups (Caliskan, 2014).

Furthermore, Burritt (2004) found in his studies several barriers for successful implementation of environmental management accounting. For example, a strong misperception that environmental costs are not significant was found and therefore companies

are not motivated to underline these problems. Meanwhile the ignorance towards environmental costs' significance was clear, there were also multiple observations where indirect environmental costs were added on overall overheads to be simply allocated without a further consideration. Measuring environmental impact should be done so that the whole organization is committed to the process and the level of implementation is not only related to the direct cost savings as Burri (2010) explained.

Other observation was that if companies have taken a further step to manage and measure their environmental performance, they have decided to focus only on financial measures and they lack of knowledge and motivation to measure the effect of environmental impacts. Similar results were found from the research by Burritt et. al. (2011) where local governmental institutions in Australia were following more or less absolute cost savings of improved waste management systems but not necessarily paying attention to the environmental goals itself. Focusing only a cost effectiveness of environmental investments and developments will leave the stronger commitment and understanding out, leading to the situation where possible comparative advantage benefits are not recognized.

Burritt's third and last notice is also significant. He found from the interviewees answers that strong regulative restrictions and laws forces accounting practices to focus certain measuring areas. If the obligating law is not pushing organizations to measure their environmental impact, accounting practices are not taking further steps to assess environmental performance. This regulatory environment of accounting significantly affects to the way firms see their obligatory accounting and environmental processes and how willingness they are to implement environmental performance practices into their operations. This as well underlines the need for further legislation development that would move obligatory accounting practices include environmental performance measuring as well and thus create requirements for combining environmental knowledge and culture to the accounting measuring and controlling practices.

Finally, social and environmental aspects are largely ignored since economic measures were considered more important and executive compensation structures are a valid proof of this. As Gray and Beddington (2001) pointed out, if the company is seriously implementing environmental targets into their core business, executive compensation should reflect these goals as well. If the management and employees of the company are not motivated to reach

environmental goals, the pressure for organizational change and commitment will not be easily built. In the formal decision processes environmental targets will most likely then be impossible to be justified. Additionally the risk for sabotaging information is real since often environmental targets and primary goals can be in the short run conflicting with the financial goals, motivating organization not to focus on environmental performance measurement or the management.

3.8 THEORETICAL SUMMARY

To conclude the theoretical section before moving to the empirical research part, following key areas related to environmental performance measurement and management accounting can be summarized.

To start, management accounting research has been contributing to performance measurement literature both from operative and strategical perspective for decades. Environmental performance measurement has received its own place among the performance measurement areas due to increased amount of related journals and increased environmental risks related to businesses. As Parker (1997) argues, in times of environmental issues, companies seeks to quickly gather information for environmental performance evaluation where EMA practices play significant role in managing these challenges. While environmental performance measurement has its own technical challenges, management accounting has problematized the connection and relationship between traditional business functions and environmental performance measurement practices. Management accounting and environmental performance measurement are still in unstable situation, where scholars and businesses are trying to define and understand how integration could be modeled and implemented efficiently. While there are several theories and empirical research available, best practices are still debatable.

Despite of common consensus, developed models and tools, such as EMA, EMS, LCA and EPIs are examples of existing integrations between management accounting and environmental performance measurement. The main idea behind is to integrate environmental performance measurement into core control and planning processes to support the decision making and provide essential information, on both operative and strategic level. Due to tightened regulative pressure; increased demand for environmental friendly products and

services, and increased environmental risks, businesses are becoming more active on the field of environmental performance measurement.

However the challenges towards utilization of environmental performance measurement remain strong. Integration between management accounting and environmental performance measurement processes confronts several practical organizational practice and process issues. Among in many, academic research argues that dominant challenges are related to the practical processes, employees and supportive organizational culture and norms. Some of the issues are similar with the traditional performance measurement practices, some are related to the nature of environment. Following empirical part, after chapter 5, aims to enlighten these challenges and provide further evidence of successful integration.

4 DATA AND METHODOLOGY

Before moving to the empirical part, in this chapter the actual research methodology is explained.

This study was conducted as an interview study, where semi-structured approach was selected to be used. To add on the conducted interviews, a large amount of case company's disclosed material were used to draw a comprehensive picture together with the received insight from the interviews. Disclosed materials are publicly disclosed on company's website. All interviewed persons are working in the same company, having a managerial or similar position. All together four comprehensive interviews were made in the company's own premises between November 2016 and March 2016. Finnish was used as interview language in all interviews. These persons are managers from either renewables or traditional business function while one manager is responsible of the environmental management, being involved in both functions.

Name	Position	Function	Interview duration
Manager A	Environmental director	Corporate	80 min
Manager B	Planning and control director	Traditional	60min
Manager C	Supply and purchase manager	Renewables	60min
Manager D	Planning and control director	Renewables	45min

Interviews give researchers possibility to directly investigate the phenomenon by discussing with the persons who are in contact with the phenomenon. According to Dumay (2011) semi-structured interviews allow the researcher to modify questions during the interviews so that as holistic picture as possible would be able to be constructed for the study. While the research topic and focus is relatively complex and multidimensional, the interviews were constructed so that they allow interviewer to adjust the questions if necessary and ask more specific questions. Even though the structure of individual interviews may vary, the purpose is to cover all relevant aspects in order to get enough information from all aspects. Dumay states also that semi-structured interviews are suitable when the researcher want to gain knowledge from the topic that has not been investigated lot, like this thesis study.

Qualitative research method was selected for this thesis for purpose. According to Eriksson and Kovalainen (2008) the purpose of the qualitative research is to understand and analyze

selected phenomenon. In this study the idea was to go through existing literature together with company's disclosed material and understand where interviews are required to gain better understanding of the current stage. In qualitative research the purpose is to deepen the understanding of the object and to build more new knowledge around the researched phenomenon. In qualitative research, research data is in most approaches sensitive to the context, and the analysis of the data aims to be built a holistic understanding of the issue studied. While the research object is often dependent on the context, qualitative research findings are sometimes only existing in that research, making it hard to conclude universal proposals. As this study, the purpose was to understand this specific company's environment performance measurement, not offer explicit answers.

The mentioned benefits emphasize the reasons why interview study and semi-structured approach was chosen for this thesis. The purpose of this study is to gain more knowledge about the gap between environmental performance measurement and management accounting processes and to contribute into the practical academic research. Interviews in one organization were fruitful option, since it allowed to gain deep understanding how the case company is organizing their environmental performance measurement practices and which challenges they face. Focusing on a single company allowed to focus on specific issues.

Significant importance for this study is that the interviewed group represent people from renewable businesses function and traditional businesses functions, making the answers and interviews more heterogeneous. Interviewed people are from educational and work career background either from accounting and financial side or environmental and sustainability side. Interviewing these persons gave an approach from two different perspectives and also from two different business approaches. This allowed as well to focus on some areas of the research more closely with those who had better knowledge and understanding of the related area making the received information even more specific and fruitful. At the same time this study was able to conduct information about specific issues from two angles, being able to more closely understand challenges which are related to the integration processes. This was significant benefit of the selected method since; the knowledge and expertise area of individual interviewed person was hard to be noticed in advance.

Even though qualitative research method was selected and later recognized to be sufficient option for this study, there are also counter arguments towards the qualitative research interviews, saying that they lack of objectivity. As Kvale (1996) state, there are no commonly

agreed definitions for the concept of objectivity and therefore it is impossible to argue whether the study is objective or not. In this study, the interviewer does have an influence on the research findings since the conversation between the interviewer and interviewed person sometimes resemble more a normal conversation. However, interviewees were done so that no direct suggesting questions where given, but questions were focusing on to be asking to describe and explain the research phenomena. As pointed out by Eriksson and Kovalainen (2008) a good qualitative interviewer most often prepares the interview questions in advance and relies on those questions throughout the interview session.

4.1 DATA COLLECTION AND ANALYSIS

As mentioned in the previous chapter section, this study was conducted as qualitative research with semi-structured interviews. Qualitative data collection method was selected for this study. The data was collected from the managers of the case company who are familiar with the research topic in their own organization. Also company's disclosed material was used to together with interviews to provide comprehensive answers. Interviewed persons were selected so that they would be able to together to describe the researched phenomenon from enough heterenogenous perspectives, bringing comparative knowledge and expertise analyze to the data. However, suitability of interviewed persons were not revealed until in the interview moment, making the semi-structured interviews to be suitable option for this study due to the methods flexibility.

Some of the interviewed persons asked to see interview questions in advance in order to provide time to prepare for the interview. This was found to be neutral option for the study as well, since the interviewed who asked to see questions in advance were able to bring out some insight information that perhaps otherwise would not have been revealed in the conversations. The questions that were sent in advance only included the main topics of the interview but not the actual insight questions. All interviews followed the same semi-structured structure, allowing the data analyze phase of this study to easily compare the answers and draw conclusions. All interviews were 40-80 minutes long. All interviews were recorded with permission and were analyzed later by the interviewer.

Kvale (1996) presented six separate approaches for analyzing interviews. First of all, interviewees can describe their experiences spontaneously and there is little interpretation or explanation from interviewer. Secondly, the interviewees can themselves discover new relationships during the interview free of the interpretation by the interviewer. In the third choice, the interviewer summarizes and interpreters what is said by the interviewee and asks clarifying questions in order to understand the true meaning of the interviewee. This kind of method is also called as self-correcting interview. The fourth analysis method is to interpret the recorded and transcribed interviews either alone or with other researchers. In this approach, researcher usually conducts the analysis in three parts. Firstly, the researcher structures the large material in a chosen way. Secondly, the researcher clarifies the material. This usually includes distinguishing the essential material from non-essential and eliminating repetitions. And thirdly, the researcher analysis the material by bringing own subjective understanding and theoretical knowledge into the light.

In this thesis mostly self-correcting analysis and transcribed interpretation were used. By conducting the interviews, the interviewees were asked clarifying and specifying questions concerning their views on the topics.. In this way, the interviewer tried to ensure that no false interpretations about the themes were made. Furthermore, the self-correcting interview gave the interviewees possibility to correct the interviewers view or interpretations on their answers. The analysis consists of all three steps: structuring, clarification and bringing both subjective and objective understanding to the topic by reflecting the research data to the existing theoretical literature and prior research.

Figure 7, Research structure

4.2 RELIABILITY AND VALIDITY

As in all academic research, found results and the actual work should be available for evaluation and critique (Long & Jonhsson, 2000). The evaluation can be divided to the work itself or for example for the research methods only. For all research, there are certain elements that evaluation often includes: reliability, validity and generalizability (Eriksson & Kovalainen, 2008). Reliability reflects to possibility to get similar results if the study would be repeated by another researcher. Validity considers the aspects whether the study is logic, and whether the results are interpreted in the correct way.

According to Yin (1984) four different tests can be used to examine the quality of the research. Firstly, construct validity questions whether correct measures are being used to describe the research phenomena. All research should be able to argue in a meaningful way why selected methods are suitable to execute the research. Secondly and thirdly internal and external validity needs to be examined. This means that whether the research is describing causal relationship between different elements or events correctly and whether causalities are repeatable outside the single study. Last point is referring to overall reliability: whether the same results would have been examined if someone else had done the study.

In this study, construct validity and internal validity were ensured by using several theoretical and literature view, which provided framework for the interview question pallet. Similarly, the empirical study was conducted with four interviewees in order to gain insight that could not be conducted from the disclosed public material, which reduces the possibility of false interpretation. Also if the answers would have been significantly different from each other, more evidence could have been collected. Findings were also analyzed so that they together were in harmony, causing no conflicts within same internal function. In this study however the difference between the business functions are existing, causing issues for internal validity, however interviewees were asked to also describe not only their own function but also the other one. Even in these answers no significant conflicts was found.

For this study the external validity should be able to be tested. The used literature does not only apply for the case company, but the found results are more or less describing one single company and its reality. However the external validity can be expected to be lower in this

study since, the complexity of environmental performance measurement and related accounting processes are concrete. On the other hand this study is done since other empirical findings would not perhaps apply for this certain company, making the research gap existing. Partly this study can be used as case examples elsewhere but the suitability in other context in terms of resource structure or findings may not suit well.

5. EMPIRICAL STUDY

As explained in earlier chapters, semi conducted interviews together with the disclosed public company documents were used for the empirical study. Semi conducted interviews are suitable when interviews possess different background and knowledge and asking all the same questions from all interviewees may not be fruitful. Semi conducted interviews also provide possibilities to focus on certain issues where the interviewer aims to find best answers for the overall research topic. While some of the interviewees were focusing more on some subjects than other, mainly depending on their own position and managerial approach, some questions were not highlighted in the individual answers as much as other questions in other interviews.. While different approaches and opinion were collected and analyzed in this study, the purpose was not to find any frequency or repetitive findings.

The structures of the interviews however were similar among each other. Questions were related to purpose, structure and the meaning of the performance measurement to reveal the level and spectrum of the integration between accounting and environmental measuring processes. Interviewees were also requested to describe how measurement is linked to operational, strategical and other target levels and how are these then visible in the organizational culture. The second part of the interviews was more focusing on the challenges and issues towards successful environmental performance measurement and integration. These questions, as explained earlier as well, were not based on the technical approach of performance measurement, but more on organizational and accounting related level. The list of the interview questions can be found from appendixes of this study.

5.1 OVERVIEW OF THE ENVIRONMENTAL MANAGEMENT AND MEASUREMENT IN THE CASE COMPANY

In the case company, the overlook for environmental management and measurement can be conducted based on their disclosed reports from the company website. Among other companies who report sustainability related information, common frame is to use the triple bottom line, presented by John Elkington in 1997, including economic, environmental and social aspects. Case company's report is in this in line with the current trend and they are reporting comprehensively about their sustainability annually together with annual reports.

Since this study is interested on environmental performance measurement, focus for environmental issues were given, leaving the social connection out. Since economic area is strongly related to the environmental side in this study, the economic aspect is firmly following in interviews and other findings.

Environmental performance measurement and environmental protection in the case company are part of the bigger sustainability framework and management, which covers all active processes and functions of the company. The case company measures their environmental performance of their office facilities, manufacturing facilities, environmental impacts of their products and other possible externalities of their operative processes and supply chains accordingly. Reported items reveal how and what the case company is measuring in the field of environmental performance. Reported statistics and figures are based on the indicated quantities of used resources or emitted emissions, collected by selected EPIs. Case company's publicly disclosed reports include statistics for following factors:

Emissions
CO_2, reported in all 1-3 Scope categories,
VOCs
NOx,
SO_2
Particulate matters
Energy usage
Total energy consumption, divided for fuels and natural gasses; electricity and heat
Water usage
Emissions into waters
Waste tons, divided for waste disposal and reuse, and hazardous waste

Simultaneously, the case company discloses data for how much their sold renewables products have contributed to the GHG reduction compared to the conventional products. This information has been further opened by separate information section, which demonstrated the process chain of renewables products together with related LCA calculative information. They also disclose information how much they have avoided of using virgin materials in their production raw materials. From the manufacturing facilities, even statistics for recovered carbon dioxide emissions are included.

All environmental performance measurement data is systematically and comprehensively conducted, supervised and analyzed. Historical yearly data are disclosed to provide

benchmark and to illustrate past and future improvements and trends in the company's environment performance. In line with Kuisma's model (2016) and Tibor's and Fieldman's (1996), the case company is actively following normalized and absolute environmental performance via selected EPIs. For the products, disclosed documents include normalized environmental performance data since the customer value of their products, especially renewables products', is based on favorable environmental performance. From the disclosed material can be concluded that case company is actively using LCA to analyze and report their products' environmental footprint. The case company explains and illustrates in their reports how their target is to create more environmental products in the future and how they will drive towards these targets year by year. For this, there are clear progress maps with concrete targets for the forthcoming years.

Simultaneously the case company is following its absolute environmental performance and disclosing in their documents how they pursuit to achieve lower total emissions and decrease the total environmental impact of the whole business. From the environmental management side, case company has informed to be following UN global compact guidelines and related ISO environmental management principles, and GRI Index for the reporting purposes. Disclosed reports and other information reveals underlining principles how the case company is handling their environmental performance measurement: in order to be able to disclose certain information, they need also measure environmental performance accordingly. To further open how environmental performance measurement is practically arranged in the case firm, the overall structure of the environmental performance management is described below. Case company's official organizational structure do not necessarily follow below graph, but the below graph is built to demonstrate the difference between different product functions and how environmental performance is organized in those business functions.

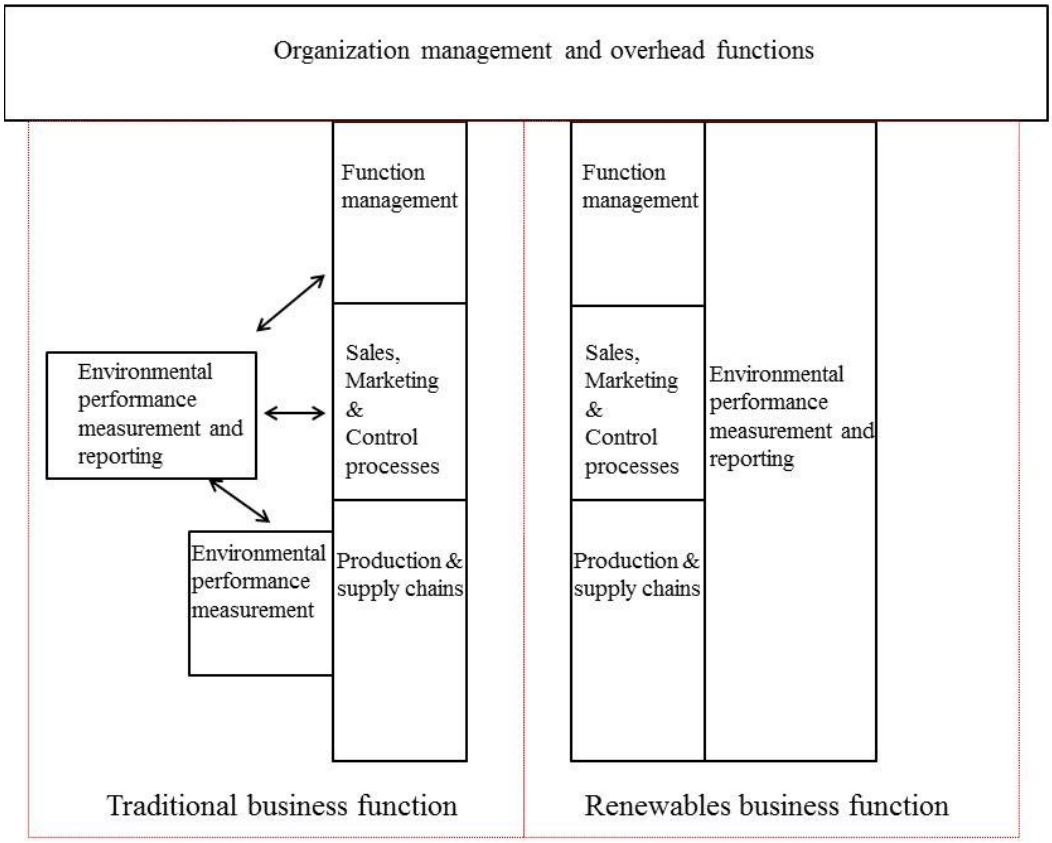

Figure 8, Organizational structure

Measuring environmental performance in the case company is implemented in two different ways. Apart from the production and supply chain level, in the traditional function the environmental performance information is managed by the external team which is responsible of the analyzes and reporting. Environmental performance measurement is integrated into the business control functions mainly at the production level where multiple EPIs are integrated to measure emissions and resource consumption continuously. In the renewables function, the integration of environmental performance management and measuring is vertically connected to the operative processes.

Reflecting to the Fieldman's s and Tibor' model, both traditional and renewables business functions can be seen including the Environmental Management Systems and Life Cycle Assessments where existing performance measurement practices do fulfill characteristics for both side. At the production level, environmental performance measurement process is automated in order to monitor environmental emissions and resource usage in real time and the information is provided for further analyses that supports LCA processes as well. From

data, processes are monitored and built to highlight and flag immediately if normalized or absolute value aberrations occur in the environmental performance, triggering immediate correcting maintenances. Inside both functions similarities at the production level are clear, and all environmental performance measurement have been arranged on adequate level to ensure that production stays within required emission levels.

As disclosed public material reveal, environmental performance measurement is existing at the production level and in the highest management level where even the compensation structure is including environmental targets. To further understand how the actual environmental performance measurement have been integrated as a part of the overall management and management accounting processes, and how environmental performance is visible at the middle of the organization's functions, conducted interviews were able to reveal more closely the reality.

5.2 INTEGRATION IN THE TRADITIONAL FUNCTION

In the case company the integration between accounting and environmental performance measurement practices are visible in multiple processes. However the difference between traditional and renewables functions are relatively remarkable. Following questions in the interviews were meant to reveal more thoroughly how environmental performance measurement is integrated into the management accounting processes. Reflecting back to the theoretical literature and prior research, questions were prepared so that they were trying to gain information whether the organizations have integrated these two functions and how they have accomplished that. Simultaneously interviews tried to observe possible best practices and challenged towards the integration and environmental measuring processes.

5.2.1 Purpose of environmental performance measurement in the traditional function

Interviewed managers were asked to explain in their own words what is the purpose for the environmental performance management in their function as there should be logical reasons for the execution of these processes. The idea was to force interviews to reveal the

fundamental ideas and motivations why they think environmental performance measurement is implemented internally, since the purpose of the possible processes should define how those processes are designed and utilized.

For the traditional function, purpose for the environmental performance measurement, other than environmental protection itself, is to mitigate operative risks and direct emissions expenses. The case company has a clear cost pressure from the legislation side to follow their emissions sensitively. When asked to explain the fundamental reasons and motivation behind the environmental performance measurement, Manager A of the interviewees explained:

> *"Our firm is listed under the EU emissions trading scheme which forces us to follow our carbon emissions coming out from our manufacturing facilities."*

Manager C's comments on same question to add on the Manager A's opinion:

> *"There are certain limits where we have to ensure our pollutions stay. If we cross the maximum pollution limits, there are clear additional costs which we aim to avoid in any circumstances."*
>
> "*This business is heavily polluting business and the pressure to reduce pollutions due to financial profitability is strong, but also the pressure from the company's stakeholders is remarkable."*

The strong regulative legislation has been shaping organizations operative and strategy targets in the traditional business function for decades. Since the regulative environment is imposing a direct causality for the emitted emissions and financial expenditure, the case company is following their environmental performance for the regulative reasons constantly through EPIs, which have been connected to the overall control and monitoring systems.

The second clear reason for environmental measurement is coming from the strategy. The strategy is including clear process safety goals that the case company cherishes intensively. Managers where further asked to explain how the process safety is visible in the environmental side:

> "*Environmental measurement is visible in our overall process safety. We receive clear goals for process safety from the highest management, which includes*

compulsory targets for example emissions leaks or avoiding any kind of environmental damages. " - Manager C

Third significant reason for the environmental performance measurement practices is related to the potential to gain comparative advantage. The case company noticed a long ago that markets were favoring products with better environmental performance than the competitors were.

"Already in the 80's, our firm's sales persons noticed that our less polluting products was seen as an advantage by the customers and it boosted the sales. To develop even more environmental friendly products, has been a long time on our agenda" - Manager A

The argument is still valid as Manager D explained

"*In the certain markets, customers clearly demand products to fulfill certain environmental performance criteria. We have succeeded in these markets due to capabilities to provide quality products, which are environmental friendly at the same time."*

These answers highlight too main reasons for environmental performance measurement practices in the traditional function and why those have been integrated as a part of the overall control processes. Firstly regulative requirements together with the internal motivation to focus on process safety have been pushing the organization to measure their environmental performance, and secondly realized comparative advantage have motivated to develop more environmental friendly products than average products in the markets.

5.2.2 Integration in the traditional function

After first section in the interviews, the purpose was then to reveal how environmental performance measurement information would be utilized in the accounting and operative control processes. In the traditional function, the linkage to the financial accounting systems at the production level in traditional function is existing, but the greater linkage to the accounting and control processes is ambiguous:

"*We do allocate operative expenses for environment categories for the bigger reports, however the result is not something I would be using constantly…*
… what is visible, is that remarkable parts of expenses go the environment related areas so we do follow environment investments a lot"- Manager C

These answers indicate that environmental performance is followed actively, however not by the internal processes or for the accounting matters. As mentioned earlier, environmental performance measurement is outsourced in traditional function for external team, which is also visible in the answers. Manager C further explained the structure of environmental performance measuring and practicalities in their function:

"For our function, we have a separate unit that measures the environmental performance which then supports us. Environmental performance is visible in our monthly reports in the format of indicators. There is a section in our report however for me as a manager in business control function, my focus is not there."

Manager C further continued:

"*We follow actively the safety and process control which includes naturally environmental aspects as well in terms of possible emissions leaks. We measure how much our processes are pushing the emissions to the sky. If we discuss target setting, we do emphasize process safety where environmental performance is included. There we follow the emissions and ensure that we don't break the rules."*

According to received answers, traditional business function measure environmental performance data in their operative control processes but apparently the attention is not to follow environmental performance constantly for business control and planning processes.

A comment from the Manager C explains the situation:

"It can be said, that me as a person with a business background, my knowledge towards environmental issues is not that strong. The information regarding our environmental performance and targets are on my desk quite often, however the systematic measurement and follow-up functions have been outsourced to

specific department. It is already enough time consuming to control the financial side.

Manager A commented also the visibility of environmental performance in the traditional function:

> "*In reality, business people … they don't really have any access to some system where they would see environmental performance data. They see if they want from the monthly reports."*

Manager A continued then that in the traditional function there is no information system placed which would work as a EMA or EMS practice specifically. Environmental performance is mainly visible in the reports. The organizational structure supports cross-functional teams where information is shared mutually, but no systematic processes exist except the monthly reports and some meetings where environmental figures are further opened.

As explained previously, in the traditional business the overall purpose for environmental performance measurement is to ensure that emissions will stay within allowed levels. This requires significant direct investments into the physical operative processes and facilities, creating environmental management related processes. Interestingly, after the production phase, environmental performance measuring functions and coordination are outsourced to the external team in the traditional function.

> "*Which probably is the traditional way to organize these things"* – Manager D

Thus EMA practices are visible in the production level but integration between operative control and financial processes and environmental performance measurement exist in the traditional function as an integrated module only in production level. Control and accounting processes in the traditional business function do not anymore deal with the environmental performance information or measurement data so actively after the production level when moving upwards in the organizational structure.

Manager C explained when asking if they have a systematic analysis of their environmental performance and relation to the cost expenditures:

> *"We don't do such an analysis in our business function. Of course when we make investments we do have an environmental performance analysis since they are a big cost trigger for our business. We actually invest a lot in environmental investments and those eat our cash flow quite a lot … … we don't have such a functionality in our controlling processes where we would systematically analyze the environment aspects effect on our profitability."*

The environmental performance information from the production level is shared for the operative control processes via separate reports systematically but the systematic analysis are not automatically processed in the accounting or management control processes internally in the functions own processes. From Manager C it was further inquired if there are other relations between environmental performance measurement and formal accounting and control processes other than direct expenses from manufacturing the answer was revealing:

> "*Being honest no. We have anyway outsourced those processes out for other part of the organizations… As mentioned we execute heavily on environment protection related investments and we measure those.*

Manager C explained the situation that they have had a lot of projects with sustainability people internally for to create reporting but no systematic processes exists. Reports are further provided then for the external environmental management team and to upper management. The scarcity of information flow in the traditional function more or less proves how essential EMA processes are for providing environmental performance information for the decision-making. The manager C admit that they do share on strong operative goal to make their products more environmental friendly due to previously presented reasons, but no environmental systematic analysis for the control processes are implemented.

Remarkably, in the traditional business function it seems that systematic environmental performance measurement and management are not integrated into the operative control processes or management accounting practices. Even though a) inside their own organization they have more advanced processes existing in the renewables function, which could be implemented into the traditional function as well, and b) there clearly is a strong connection

between environmental performance of the processes and the products' LCA and the financial profitability. Despite of the production level, separation between control processes and EMA practices is rather visible in traditional function.

5.3 INTEGRATION IN THE RENEWABLES FUNCTION

Compared to the traditional function, renewables function possesses similar environmental performance principles and processes. However, in the renewables all the processes are taken relatively further to more integrated level and the connection with accounting practices is visible.

5.3.1 Purpose of environmental performance measurement in the renewables function:

In the renewables function, they share all same motivational principles for environmental performance measurement than the traditional function. Regulatory challenges are affecting also on their business and strategic goals have shaped their functions' internal key indicators. Compared to the traditional business, most remarkable difference is related to the business logic itself of the renewables function. The whole business idea of renewables function relies on the superior environmental performance of their products. This is shaping completely how environmental performance measurement practices are integrated into the existing accounting processes and how EMS practices are visible internally.

Manager D from the renewables function explained the role of environmental performance measurement in their function:

> *"As a part of key KPIs in the renewables, environmental performance indicators are part of the all operative KPIs. How I personally see those, I don't even consider environmental KPIs to be environmental KPIs, since those are so essential and crucial part of our business.*

A second comment from the Manager D is explaining further the purpose of environment performance measurement practices in the renewables function:

> "*When we create new products environmental performance evaluation is a central part of the process… Actually it is the fundamental reason of the existence of our function."*

Manager A further continued:

> "*In the renewable business function, the linkage between financial profitability and environmental performance is well understood inside the organizations and everyone knows it's a win-win (environmental and financial targets) situation as its best."*

In the renewables function the reason for environmental performance measurement are similar than in the traditional function, but the environmental aspect is clearly more dominant. Since the whole business relies on the environmental performance, the motivation to measure it is natural for the function.

5.3.2 Integration in the renewables function

Environmental performance measurement in the renewable function is visible in multiple operative processes and strategical goals. In the interviews, no one is mentioning EMA or LCA by name but both concepts are visible in the renewable functions daily processes more than in the traditional business function. As the comparative advantage of the renewables business relies on environmental performance of the products, case company's renewable function's systems are collecting systematically environmental performance data from the production facilities and advanced level LCA assessments are in active usage. For example, renewable products' environmental performance is a key selling argument, which is based on mainly the CO2 emissions reductions compared to the conventional products.

Interviewed persons were asked to open more closely how environmental performance measurement is executed inside the function. Manager D gave an example how energy consumption is connected into their accounting and control processes:

> *"When we follow out energy efficiency (electricity, gas, water input) of our production facilities, the energy efficiency measures are not only environmental performance indicators but also a direct link to the financial side. The less we naturally use energy, the more we make financial savings. Naturally, the performance indicators are measuring the consumption of energy in itself, but those are connected to our financial forecasting systems simultaneously. So if we manage to find solutions to decrease the consumptions, we systematically follow the causality between energy performance and financial expenditure in order to spot the best practices."*

To further reveal how environmental performance is integrated to the financial analysis and overall management accounting processes, manager D explained the system more:

> "*It depends on the field of environmental performance when and how the performance is converted to the financial figures. For example electricity usage and efficiency is quickly cumulating on a factory level, giving financial analysis for the electricity usage in one production facility. But then on the other hand, information for the environmental performance of our raw materials are sometimes combined not until than in the management reports."*

It may sound as the information would not be utilized enough in the operative process level but manager D again further revealed more:

> *"Most of the these things are so that we know that if we succeed in this, it will lead to these kind of positive results. We understand well the causalities of our EPIs. At the time when we have modeled the indicators, we have realized that is not necessary at every point to calculate and evaluate how the performance is affecting on financial profitability"*

These analyses are clearly reminding EMA processes, where environmental performance measurement via EPIs are closely integrated with the accounting and control processes of renewables' processes. As the interviewees explained, in the renewables function EMA processes via selected EPIs are providing related performance data for marketing purposes, communication, financial analyses and internal process control functions, indicating that environmental performance measuring practices are in the very center of the whole function,

and integrated closely to accounting processes, which work as a main information system in the function.

Further discussion revealed, that overall key EPIs are integrated into the control systems guiding the organization to choose and execute options which focus on maximizing the environmental performance of the whole renewable business function and product portfolio. The focus in LCA evaluation is focusing on the absolute improvement in environmental performance together with the financial profitability. To further illustrate the role and structure of the environmental performance measurement where accounting processes are integrated into those, two examples will be explained:

Firstly, in the purchase function, all potential raw materials of the renewable products have to be evaluated by financial, technical and environmental side. The selection of suppliers and purchase process for raw materials are linked to the environment performance:

> *"We closely monitor that the supplier and the provided raw material are both favorable in terms of environmental performance. These have to be in line even before the financial analysis.* – Manager B

In the formal supplier approval process, the overall evaluation is built from several aspects, which require input from financial, technical, environmental and sustainability approaches. All approaches will be evaluated separately and certain minimum criteria have to be fulfilled. Environmental performance in supplier evaluation is connected to broader sustainability analysis which further guide the purchase function to select only suitable suppliers. After the sustainability analysis, financial analysis can be processed. The evaluation is thus a mixture of several different opinions, where environmental performance is closely connected to other key performance indicators, which "grade" potential suppliers in the process.

LCA thinking is strongly implemented in the renewables business model and its visible in the material purchase especially. To further open how raw material evaluation is done, it was asked from the interviewed managers to explain more about the raw material analysis. Production of the renewable products sets certain technical limits which cannot be evaded, and environmental performance is in the priority of evaluation even before the financial analysis. The case company has developed so called ABC evaluation tool which combines performance and quality evaluation of environmental, technical and financial side. When

discussing about the raw material purchase functions of renewable business segment, Manager B's answer is well describing:

> *"The environmental impact of the product is the most important criteria for us. The whole business model relies on the environmental performance of the product and we could not do it in any other way. Our customers expect us to fulfill certain criteria and it would be serious brand image issue if we would not be acting sustainably. For us it means that we are constantly looking for raw materials with strong environmental performance "*

So said, environmental performance is placed before the financial analysis, since the environmental performance is actually affecting so crucially on the financial profitability. To add on, Manager A added more on the question about the ABC evaluations of the renewables function:

> "*We have succeeded to find even small, environmentally friendly raw material streams that we can use in our production, and if those streams are technically suitable for us, the cheaper materials we find, the better financial margins we can create for the products."*

The evaluation as a comprehensive environmental assessment is structured based on the formal evaluation tool that provides an overall evaluation for the raw material. In this step, environmental performance measurement is strongly connected to financial analysis as well, reminding integrated EMA practice. Since their products have to fulfill certain criteria for both financial and environmental targets, for purchaser and controllers this means that both features have to be evaluated together case by case and decide what to buy. In the accounting wise, environmental performance is integrated to cost analysis and is thus visible in accounting processes as well.

Secondly, the environmental performance measurement is integrated also to the taxation treatment of products and so forth the pricing calculations. In the case company taxation calculations and scenario analysis are closely integrated with the environmental performance measurement. As Manager B opened the field of the taxation:

> "*In EU, products that include a certain amount of renewable material component get tax reliefs. In our products it is essential part of the success of*

this business and we have to meet those levels. The requirements in order to get the tax relief are becoming more and more tight, pushing us to be more innovative with this."

In so said, the environmental evaluation of the raw material is strongly linked to the financial benefits in terms of tax reliefs. The purchase functions, and accounting systems, have to be able to evaluate the possible tax benefits prioritizing the final product margins, allowing higher raw material purchase prices. In the evaluation of the financial profitability of the renewable business functions, environmental performance of the product is a key performance driver for the whole function. However, accounting profitability analysis need EMA processes in order to be able to evaluate how production margins are acting if more expensive raw materials with better environmental performance are used, but more tax benefits could be gained.

Overall the connection between environmental performance measuring and accounting practices are highly linked in the renewable business function. As Manager D explained:

"*From a strategic goals downwards, we have a clear map for to ensure the right environmental performance of our products. Since the whole business logic relies on environmental performance of the product, environmental performance is integrated on all levels into the existing control systems."*

So said, EMA processes are in central position in the sustainable function's operative and accounting processes and practical result of integrating environmental performance measurement and management accounting together. Existing EMA processes evaluate, document and gather environmental performance information and assist in decision making. Environmental performance measurement data is required in the operative level for best execution of the strategy, for control and planning processes and also in the highest management level as interviewed mangers explained.

5.4 ORGANIZATIONAL CULTURE TOWARDS INTEGRATION

Based on the theory, some of the questions where selected to focus on the organizational culture, and how it influences on integrating environmental performance measurement. As

prior research have suggested, the shared organizational culture is important since it can either motivate employees and management to focus on environmental issues or then be a boundary for development of environmental performance related processes. If organizational culture is not supporting environmental values, integration of environmental performance measurement and accounting processes is unlikely to happen successfully.

A comment from manager A explains the current situation and influence of environmental orientated culture in the case company well. At the same time, the relation between correct EMA processes and organizational culture was revealed:

> "*Discussions between environment team and business people could be difficult. However nowadays business people understand environment arguments as well. Especially powerful is if we can show the causality between environmental actions and financial benefits. Normally perhaps financial figures would overtake environment arguments, but we can really break down the false arguments and really adjust the line in order to find the most optimal position (between environmental efforts and financial benefits).*"- Manager A

> *"Every time when we need to discuss or assess business risks or profitability, environmental performance evaluation is included. Environmental side is always considered whether it is a plus or minus for the subject."* - Manager A

In order to create sufficient environmental culture, physical structures which can support environmental measuring and evaluation practices must exist. As explained by the Manager A, existing integrated EMA and EMS processes allows environmental arguments to be even more stronger, giving more mandate for the environmental efforts and supporting culture. Nevertheless, organizations will not invest on EMA and EMS practices if the organizational culture is not supporting those targets.

As manager A further explained, the combination of physical structures and the organizational culture play a significant role in the successful integration of accounting and environmental performance processes. Regarding how environmental performance measurement information is shared and further used is affected by the organizational culture, Manager A explained more:

> *"How information (environmental performance related data) flows, that is the question. There is information available if wanted to be used. Information clearly circulates between those who are willing to hear it, but it often stops on those desks who are not actively pushing these agendas forward. Thus I can't say that the flow of information would be unobstructed. In order to improve this, the culture has a central role"* – Manager A

All of the interviewed persons agreed that organizational culture can be as well a barrier for more effective environmental performance measurement and especially in organizational members' willingness to utilize and use the available information. An answer from manager A:

> *"Even though we are far with the cultural commitment to the environmental targets, a further integration of the traditional business functions and environmental functions in this company could take a bit further with the integration."*

When asked from the Manager A if he believes whether employees from the business functions approach their daily tasks and challenges also from environmental perspective the answer is well describing the significance of organizational culture:

> *"In principle, no-one has been told to do so, there is no obligation to do so. If you have studied accounting, you approach probably your problems from that perspective. Changing the mindset, the organizational culture is important factor."*

Manager C, from the traditional business function explained further:

> *"Those who are dealing with these issues (environment), are really orientated to focus on these things. I don't see that it would have huge effect if environmental management would be more integrated in our function's accounting processes, but it could lead to fruitful observations"*

Received answers from the interviewees indicate that organizational culture has a central role on encouraging and motivating employees and managers to focus on environmental areas and how environmental performance data is further utilized. If the organizational culture includes

a strong motivation towards environmental targets, it pushes the integration between accounting and environmental performance processes as well. As in the renewables, the integration between these two processes are due to realized potential to provide comparative advantage. However the advantage would have not been recognized without appropriate environmental culture. Once the supporting organizational culture is existing, the integration of these two processes further strengthens the environmental culture once the potential of comparative advantage becomes even more realized. According to the interviewees, organizational culture in both functions are affected by the external regulative pressure, while in the traditional function it is more seen on boundary and in the renewables external regulations were seen more on motivational influencer.

6. FINDINGS AND DISCUSSION

This study's purpose was to understand how environmental performance measurement can be integrated into the management accounting processes and what are possible challenges towards successful integration. From the empirical research, three main areas can be concluded. Firstly, EMA and EMS processes influence significantly on how environmental performance measurement is integrated. EMA and EMS practices actually present the integration itself in form of organizational practices and systems. Secondly, this study found that organizational culture has a significant impact on environmental performance measurement practices. Thirdly, this study highlights the role of accountants and controllers in the middle of the integration and their role as bridge makers between two different processes, accounting and environmental performance measurement.

6.1 INFLUENCE OF FORMAL EMS AND EMA PROCESSES

As presented in the earlier chapters, in the case company environmental performance measurement has been organized depending on the function's definition whether they are operating in the traditional or renewables businesses. Apparently, in the case company there is no whole organization covering formal ERP or information management system that would be able to provide and collect environmental performance data automatically throughout the organization. In the case company organization's structure and purpose are affecting how existing EMS and management accounting practices are integrated to comprehensive EMA practices as. Since the company is divided two so different functions, the comprehensive EMA or EMS systems would not be sufficient solution.

As opened in the empirical part, the role and boarder purpose of environmental performance measurement is affecting crucially on the integration. In the traditional side environmental performance measurement is more a side function, outside from the core processes, thus integration to the accounting processes is not strong. On the other hand, the need for environmental performance data in renewables function is existing distinctly throughout the organizational chain and structure, thus integration has been taken relatively far. This finding is supporting Andersen's and Fagerhaug's (2005) and Tsay's and Hung's (2009) findings who found the existing organization's structure and targets to be the most dominant influence

factors on how EMA and EMS practices are integrated into the accounting processes. In the renewables function the environmental management is existing and shaping the function vertically, requiring EMA and EMS processes to be linked for all possible steps. On the other hand, in the traditional function though the environmental management is not included in the organizational structure despite the production level, leaving the integration of accounting and environmental performance processes to be in active only at there. In the case company's traditional function, the usage of data is limited in many cases only for the reporting purposes and not for active business analyses or control processes. As mentioned by the Manager A, information is available for those who are seeking for it but the systematic usage of environmental performance data is not existing in the traditional business functions. As Olsthoorn et al. (2000) explained, the companies often choose integration to be harshly executed, leaving the environmental performance processes outside the formal accounting and control processes. This is visible in the traditional business function as well.

Alternatively, in the renewables function the EMA and EMS are integrated at the middle of the functions' processes, creating completely different structure and level of integration between accounting and environmental performance measurement processes. According to Porter and van der Linde (1995), Andersen and Fagerhaug (2005) and Tsai and Hung (2009) integration of measuring processes into the existing management control processes is vital for succeeding in performance measurement. In reflection to prior research (Calantone et al, 2002; Burritt, 2010; Andrew & Cortese, 2011; Lee, 2011), in the traditional business function the lack of formal EMA practices allow the control processes to ignore systematic environmental performance measurement and thus do not support the full optimal utilization of the performance data. Concurrently in the renewables function EMA processes are in the center of accounting control, planning and information processes. As Bertels et al. (2010) defined, many organizations tend to leave sustainability functions outside the core operative processes when the vertical integration will be left out. The risk is that the information is not utilized and the environmental performance measuring processes itself become partly useless.

As revealed by the interviews, product's environmental performance can be seen as an advantage regarding end-user preferences and thus improve the sales potentially. Nevertheless, in the traditional business function, as explained earlier, EMA and EMS processes are designed to meet more or less only regulative requirements. EMA and EMS processes are not designed pro-actively support decision making or measuring environmental

performance for financial controlling purposes. EMS and EMA practices are mostly outsourced and the function has not perhaps realized the potential of having integrated EMS and EMA processes. Additionally in the renewables function integration between environmental measurement and accounting processes are visible, and benefits are obvious. As Ameer and Othman (2012) suggested, having EMA and EMS processes do visibly benefit companies financially. These findings in this study support previous literature which have suggested that environmental performance measurement practices require to be integrated to the accounting and control processes or otherwise the full utilization and benefits cannot be achieved (Calantone et al., 2002; Henri & Journeault, 2007; Moneva & Ortas, 2010; Lee 2011). This case company study is in line with all previous researches that suggest strong implementation of EMA processes in order to fully utilize the benefits of environmental performance measurement. From this study, it can be concluded that EMA and EMS systems work as an integrating element between environmental performance measurement and management accounting.

As Cuthbertson and Piotrowicz (2008) stated, organizations may underline the importance of environmental KPIs but do not necessarily implement those as a self-correcting processes that would provide guidance for organization to improve their environmental performance. Their finding applies as well for the case company. In the traditional function, sustainability is left outside the core function's structure, making visible physical and mental gaps between environmental measurements and accounting processes even though already existing EPIs are recognized to be valuable for the function and the linkage between environmental performance and financial profitability is understood. In the light of formal EMA and EMS processes, it can be stated that existing habits, manners and organization's cultural factors are rejecting the traditional function to go even further with the integration.

As Arena et al. (2010) and Ballou et al. (2012) found, organizations are nowadays realizing the connection between business risk assessment and environmental performance. In the case company, integrated EMA and EMS practices are designed especially to mitigate operative risks. Constantly on-going follow up via automatic environmental measuring systems are ensuring that possible environmental risks can be reached immediately in order to avoid additional financial expenditure. Integrated systems allow controllers and managers to see, analyze and gather environmental performance data in real-time from the manufacturing facilities, giving them possibility to control the environmental performance. These systems

simultaneously are linked to the accounting processes via EPIs, creating relevant information of cost drivers for operative financial analysis. As Burritt (2004), Henri and Journeault (2007) 2010) and Calantone et al. (2012) stated, organizations can via EPIs provide information for operative control processes if integrated into existing control systems. This study highlights the significance of using EPIs and the integration into the other operative control processes.

Despite the advocate integration in the case company, even in the renewables function, function's integration includes further challenges. As manager D pointed out, the LCA is not fully automated even in the renewables function and the integration between environmental performance measurement and accounting processes require additional effort:

> "*Even though the environment measurement performance information is connected into the (regular) control processes, there still need to be a human labor between the control and environmental performance systems in order to make the integration work. Basically the work includes combination from several information sources."*

Thus the existing systems are still not able to process environmental performance data automatically and the integration is not perfectly supporting information utilization. The different nature of environment related data requires analyses by the controller before it can be linked to the financial control processes, indicating that the controller in charge have to understand both environmental performance information and traditional financial controlling processes. In processing of environmental performance data, physical EMA and EMS processes must support the overall integration and provide tools for to execute the flow of performance data. As Bartolomeo et al. (2000) and Bennett and James (1998) explained, EMA practices have to support cross-functional cooperation and communication between different managers and teams and the more automated the process are the better. Human labor can include a higher risk in terms of information flow and do not maximize the efficiency of integration between environmental performance measurement and accounting processes. Thus the case company can even more develop the existing integration, even though processes are already on advanced level.

Surprising but interesting finding from this study is that how environmental performance measurement is via formal accounting processes a benefit for marketing purposes as well. All the interviews mentioned how environment performance is either affecting to brand image or

to marketing selling arguments. According to Manager C, in the traditional function as well, employees who are closer to the customer surface do co-operate with employees who are responsible of environmental management and measurement. Even though accountants are not perhaps those who operate in the customer surface, integrated accounting systems can provide environmental performance data for other functions as well, such as marketing and selling. Ballou et al., 2012 pointed out in their study that accountants and accounting processes should realize their potential to work between the environmental performance data and marketing in the future, where integrated EMA processes can have a significant input. As Caliskan (2014) showed, accounting information systems are vital for providing information for the entire organization and those systems should include environmental performance information as well. Thus in the case company the potential was realized since their marketing and communication is currently significantly branded with the environmental performance messages. Communication is also including a strong "environmental color", including arguments based on the company's and their products' environmental performance.

According to Gray and Beddington (2001), companies' compensation structure should support sustainable environmental targets if environmental targets in reality are implemented in the organization. As reported in the company's disclosed material, executive compensation is including four different strategic key environment indicators, indicating that environmental performance measurement has a strategic role ensuring a formal acceptance for EMA and EMS processes.

Related to the EMA and EMS processes, prior research highlighted strongly the problematic nature of measuring standards and aggregations of information (Bennett & James, 1998; Keeble, 2003; Henri & Journeault, 2007; Bertels et al., 2010), however this study did not find strong support for earlier literature. The problems were especially related to *how* data can be further assessed and further compared to other data sources within originations, but not necessarily on standardization. At least in this study, interviewed managers did not highlight this problem to be necessary. However if the study would have been done for multiples organizations, the study could have shown such a findings.

6.2 THE INFLUENCE OF ORGANIZATIONAL CULTURE

From this study, one of the most visible findings is organizational culture's influence on integration between environmental performance measurement and accounting processes. The culture can be at the same time an advantage for the integration and a boundary as well.

In the case company it is certain that the long lasting organizational cultural development is of the main reasons behind the organization's successful environmental performance measurement and integration. In this meaning, the culture includes the values, norms and beliefs the organizations shares together and have developed over the years. Over decades long focus and pursuit to raise environment in the center of the business ideology has shaped the entire culture to support the environmental targets. The company's internal culture is clearly reflecting these environmental goals, and the culture has affected on how accounting and environmental performance measurement practices have been developed over the years and why the case company has invested in these processes. Multiple authors (Brörklund, et al 2012; Lee, 2011; Bertels et al., 2010; Burritt, 2004) have explained that in the integration of environmental performance measurement practices with accounting the internal culture effects significantly on how successful the integration will be. This is visible in how advanced and developed environmental performance measurement practices the case firm is possessing, develop in-house by own employees due to strong cultural engagement on environmental areas.

Nevertheless, when in the renewables function the motivation to measure environmental impact is arousing internally, in the traditional side motivation is more created by the external regulative pressure. In the discussion of environmental performance measurement with traditional business function, regulative environment is often mentioned. The overall organizational culture is highlighting the importance of environmental performance also in the traditional product function, and even they are clearly committed to the values of the firm, but it practically does not affect so much on their organizational behavior than compared to the renewable business function. As its stands out, in the case company multiple practices and methods are not used in the traditional function but are being recognized to be profitable in the renewable sector. Even though these two functions are from their initial structure different, the possible benefits of sharing best practices are not currently utilized. The culture

is clearly creating a stronger state of mind for those who operate in the renewables function and creating stronger incentives to find more innovative business solutions.

As Burritt (2004) concluded in his study, the organizational commitment to the environmental performance measurement should be existing vertically and horizontally throughout the firm in order to maximize the benefits of the environmental performance measuring. Bertels et al. (2010) concluded, environmental performance measurement and management processes do not function optimally if the commitment horizontally and vertically inside the whole organization does not exist. In the renewables function, employees are more environmental focused and far more motivated on environmental performance than in the traditional function. This is visible how they understand, see and argue in favor of the environmental performance. Integrated processes between environmental performance measurement and accounting, such as EMA processes, clearly are influencing on how control processes are taken care of and how employees explain about and perceive environmental performance measurement practices. From this study, it can be concluded that organizational culture is significantly affecting on how environmental performance measurement is processed and integrated as a part of the accounting process. The integration naturally requires physical integration structures such as EMA and EMS, but EMA and EMS processes won't exist if the cultural commitment is not existing. Thus the influence flow is a circle where all factors are affecting on each other's.

As Kaplan already in 1984 stated, accounting specialist opinion towards non-financial controlling areas may be difficult and resistance can exists. Manager C's opinion was that due to more traditional and somewhat stiff business model, they are not so environmental orientated in their own function, since fundamental changes happen slowly with time. The existing culture is somewhat dominating and rejecting them to see possibilities to implement best practices from the other functions. As Raggi and Xhao (1996) show, accountants attitude towards EMA practices influences on how intensively accounting processes focus on environmental areas. However, it is clear that the traditional function is under tight competitive environment that is pushing margins of the industry lower and lower. The traditional function is already investing more on improving environmental performance than the average competitor. Nevertheless, the difficult market situation shapes the organizational culture even more in the traditional business to focus on the core business.

Simultaneously, environmental regulations are pushing the traditional business to be more environmental friendly, but perhaps does not push the organization so pro-actively to integrate environmental performance into their accounting processes. This finding is in a line with Burritt et al (2011), who found that regulative environment pushed organizations to follow their environment related expenditures, but it was not enough to make them analyze further where they could improve or how they could further avoid future environmental expenses. Partly this is not true in the traditional function, since they do invest and focus on environmental issues as well but the level of integration and efforts clearly are not at the same level than in the renewables. Partly the absence of further analysis in traditional function is due to strong organizational culture, which has not been focusing on environmental performance issues as Managers A and C in the interviews explained. To add on, as Kennerley and Neely (2003) explained the performance measuring systems' design and usage are affected by the existing organizational culture and vice versa. Therefore, existing organizational culture in traditional function has affected how organization has developed EPI and EMA processes.

To conclude, cultures does effect on the integration of environmental performance measurement practices. One interesting comment from Manager A explains how the enthusiasms can sometimes go even so far that business people must be controlled that they don't get too excited about environmental ideas:

> "*Business people do understand environmental issues but sometimes not on a enough adequate level. Sometimes business people have got so excited that they advertise environmental benefits even too much, making false marketing statements or ignoring other important factors."*

As its best, organizational culture can be an advantage for the firm and support integration of environmental performance measurement and management accounting processes or then be the violating factor, rejecting and minimizing the willingness and motivation for such integration.

6.3 CONTROLLERS ROLE IN THE FUTURE

The results of this study also raises the question whether accountants and other accounting professionals should already in their education receive a stronger understanding of EMA and environment performance management. Several authors (Andres & Cortese, 2011; Burritt & Schaltegger, 2010; Arena et al., 2010; Cuthbertson & Piotrowicz, 2008) have argued that environmental performance processes require new approach for non-financial control processes. Since accountants and controllers are in the middle of the integration, as in the case company, the future controllers do have a crucial role in the successful integration of these practices. According to Caliskan (2014) accountants and accounting need to develop further skills so that they can represent environmental information accordingly. He also argued that accountants can in the future educate and inform other parts of the organization about environmental performance, ideas and possible practices. This study supports as well that accountants role in the future can be more highlighted in the process of utilizing environmental performance and overall in environmental aspects. These supports as well Burritt's and Schaltegger's findings (2010) who observed environmental measurement processes to be close to other control and accounting processes in organizations. Especially those professionals who are dealing with the environmental performance information, their knowledge to understand causalities and environmental issues were recognized to be a crucial talent for capabilities of the entire organization.

This study's results indicate that even though organizations train their employees to meet organization's requirements, in order to fully utilize the potential of environmental performance measurement and EMA practices the education should also provide more tools for the future professionals. This finding is as well in line with Ahmad et al. (2011) and van Beurder and Gössling (2008) who underlined education's vital role regards to EMA adoption. Without appropriate knowledge, accounting professional will not be competent in managing environmental accounting systems. Knowledge transfer can exist in organizations via formal training or then already in the universities and other schools. According to the interviewed persons, most of them agreed that their controllers certainly have to understand the relationship between environmental performance and financial profitability. This was especially visible in the renewables function where the business logic requires controllers and accountants to understand and perceive the concept of environmental performance.

7. CONCLUSIONS

7.1 THEORETICAL CONTRIBUTION

In the management accounting literature, environmental management theories are becoming increasingly important in management accounting research (Lee, 2011) Prior research has not been doubtless whether environmental performance management and measuring would have any significant effect on the company's profitability (Lee, 2011). However several authors argue in favor for organizations that are able to take an advantage of the current situation can gain comparative advantage while fulfilling new emerging requirements (Moneva & Ortas, 2010; van Beurder & Gössling, 2008). The case company is an example of modern, sustainable focused successful business model where comparative advantage is built on superior environmental performance of manufactured products and the operative processes as well.

This study, even though is related to the environment performance measurement, has its contribution to the overall management accounting research. This study found performance measurement practices to be key element in modern management accounting and control processes as multiples authors state in their own studies (Otley 1999; Simons, 2000; Ferreira & Otley 2009; Malmi & Brown, 2009). In the case company KPIs are playing crucial role in providing information for decision-making and the key performance indicators are linked directly to the highest management, underlining the central role of strategic performance measuring practices. These findings support prior research by multiple authors (Haas and Kleingeld, 1999; Kaplan & Norton, 2001; Otley, 2009; Jordan & Messner, 2012).

Additionally this study can be seen to contribute studies that explain the role of organizational culture towards succeeding in performance measurement practices (Malmi & Brown, 2008). This study suggests that culture is affecting clearly on how organization discuss about performance measuring practices and how willing they are accept existence of these systems. Especially organizational culture is affecting how people use and utilize available performance data. It seems that the barriers for utilizing for example new type of performance data is highly related to the learned ways to execute own tasks.

Regarding the environmental management and performance measurement theories, this study has several contributions. Firstly, this study supports all the former academic researches stating that EMA and EMS practices can create significant comparative advantage and improve firms' profitability (Porter & van der Linde; 1995; Said et al., 2003; Burritt et al., 2011; Man & Vasile; 2012). Secondly this study's result are align with former studies that suggest environmental orientated companies to be more innovative and open for new ideas and market trends (Schmidheiny, 1992; Moneva & Ortas, 2010). The case company is clear evidence how essential EMA and EMS practices are for the renewables function's success and how successful integration of these processes can create significant comparative advantage. In the very core of the function's comparative advantage are integrated EMA and EMS systems that make it possible for the organization to measure and analyze the valuable environment performance information. These systems do not work just as information source, but there are several accounting based evaluating and analyzing processes integrated into these systems such as pricing, material purchase decisions, supplier evaluation, and product performance evaluation. EMA and EMS processes also work as control systems, guiding the employees to execute suitable options and thus limiting unfavorable behavior, which would not lead to optimal decisions.

Man and Vasile (2012) list different areas where environmental management accounting can be visible. The case company has implemented EMA practices for all of these: planning of processes and products, the allocation and control of costs, capital budgeting, supply processes, price policies and performance evaluation. Thus, this case study can provide example for all of these different EMA areas, but of course, in the light of this study, the contribution is especially for performance evaluation.

As this study was additionally focusing on the challenges of integrating environment performance measuring and accounting processes, further findings have to be concluded. As explained by several authors (Brörklund, et al 2012; Lee, 2011; Bertels et al., 2011; Burritt, 2004) the dominant challenges are related to the employees, not to the systems itself. As these authors have concluded, organizations culture, employees' attitudes towards environmental issues and commitment to the environment goals are strong constraints for successful integration of environmental performance measurement practices. As there are several reasons behind, this study found that organization culture and formal systems are together shaping how employees rationalize and motivate themselves to focus on environmental matters. If

formal procedures and processes are not including environmental performance practices or habits, it is natural that employees' focus is not on those issues. However if the organizational culture is not pushing employees to be more pro-active in terms of environmental issues, essential EMA and EMS practices will not be developed. As found in the case company, it is remarkable how differently even in the same organization EMA and EMS practices can be organized. This can be partly explained by contingency theory, which explains how different external and internal factors are influencing on the possible best practices.

To summarize how culture and existing EMA and EMS, the physical structures and practices of the integration, systems are together interconnected to each other's', following figure can be drawn based on this study.

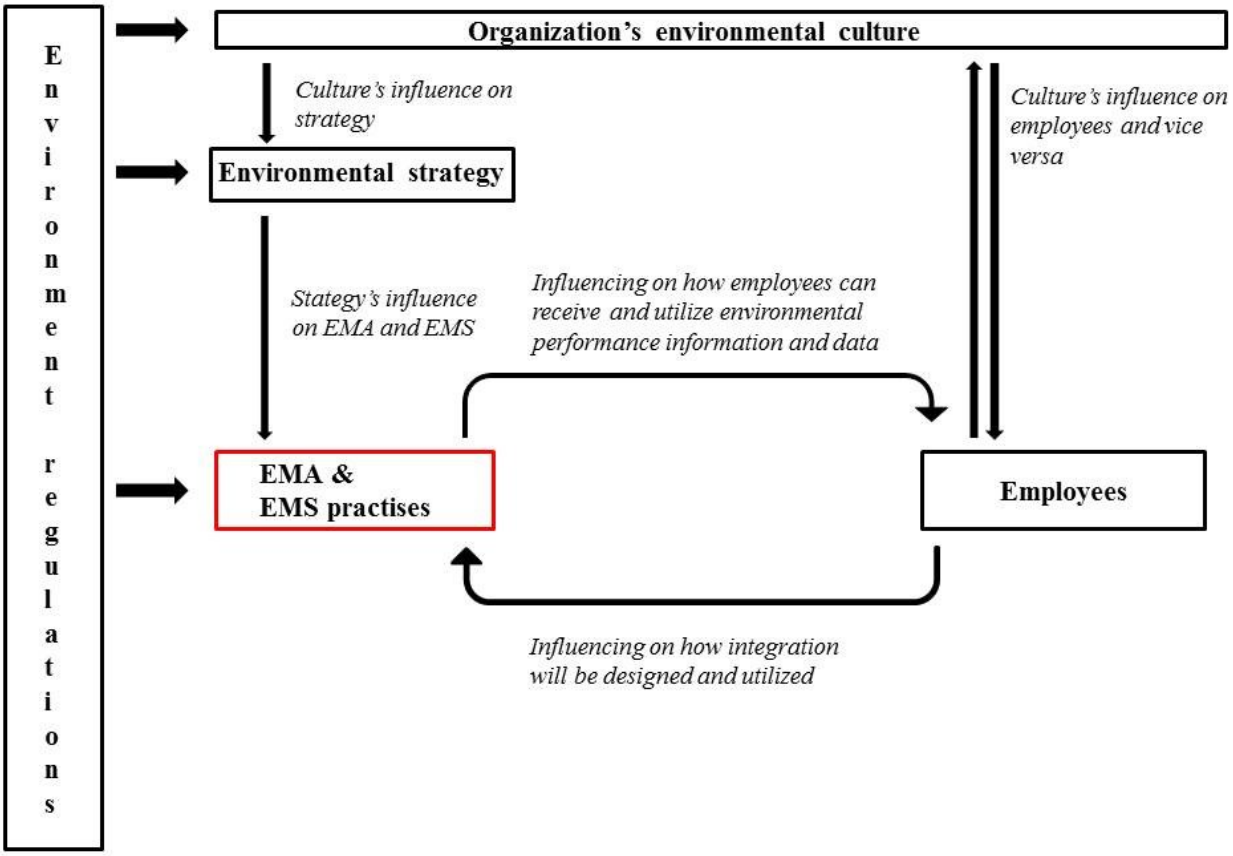

Figure 9, Network of causalities

Firstly, EMA and EMS practices are highly influenced by the organization's "environmental" culture that defines how environment supporting the organization is and how organizations'

values are reflecting environmental targets. This clearly affects on organization's strategy and especially for the defined "environmental strategy", which more or less explains how environment is visible in the company's strategy. In the case company, strategy is affecting greatly on the EMA and EMS processes, since highest management is committed to support such processes on a formal corporate level, having their compensation to be connected to the strategical EPIs. Secondly, at the same time environment regulations are pushing the organization on multiple levels, affecting the environment related pressure to grow toward organizations. While many organizations are measuring environmental performance only due to regulative reasons, regulations influence on EMA and EMS processes can be remarkable. Thirdly, a clear challenge area towards integrated EMA and EMS processes are the employees. Employees are influenced by the company's culture and at the same time shaping by themselves the culture back. As this study found, EMA and EMS practices can be on a high technical and process level, but employees' own behavior finally define how environmental performance measurement is utilized to support decision making and to work as an integrated control system.

This case study offered an excellent example how contingency theory applies on the case company's environmental performance measurement. While the renewables function has implemented and created comparative advantage where EMA and EMS processes play central role, traditional function has not been able or willing to implement as holistic processes. Traditional business function could copy from renewables function some of the environmental performance measurement tools and practices in order to improve their internal environmental performance measurement process.

7.2 MANAGERIAL IMPLICATIONS

The purpose of this study was to enlighten via case example how environmental performance measurement can be integrated as a part of the overall management accounting processes and what are the challenges. Useful practical processes were recognized during this study and hopefully these findings can provide useful information for the reader for further studies or practical implications.

As it stands out, the case company's accounting processes have been integrated with the environmental performance measurement on an advanced level. EPIs are measuring key

environmental performance from a wide range, giving the management of the company an ability to analyze environmental performance from multiples non-financial and financial perspective. As Bartolomeo et al. (2000) and Bennett and James (1998) suggest, environmental performance processes require cross-functional operations where managers from different functions and teams are included. In the case company, this is one of the key elements of successful integration of environmental performance measurement and accounting processes. Environmental performance information supports both normal operative controlling processes but it also provides support for pricing and marketing communication, creating value for the whole organization. Without sophisticated EMA and EMS practices the case company wouldn't possibly be able to execute their renewable businesses as they do now, indicating that EMA and EMS are actually part of their key competitive edge, not only supporting side functions. This study suggests that accounting and accountants could significantly improve the integration of environmental management and other core operative processes. In the surface of the integration, accounting has a natural role to provide, evaluate and manage information for the usage of other functions in the organization.

Other significant finding from this study is organizations culture influence on environmental management. Over the decades, case company's management has pushed the organization to come up with more environmental products. Already in the early stages it was clear that end users preferences favored more eco-friendly products, giving an motivation to focus on environment performance. Simultaneously strategic alignment shaped organizational culture to meet the strategic principles, creating sustainable orientated working culture, norms and values. As Bertels et al. (2010) explain, the organizational commitment requires that the strategy is supporting environment goals as well. In the case company the strategy is supporting organizational culture and its value, and including practical actions and processes which are creating practical signals for the organization. The organizational culture is visible in the interviewed managers' answers that all were completely supporting and committed to environmental management principles despite the differences between the functions.

Alternative finding from this study is that when organizations switch their fundamental approach to focus more on environmental targets instead of only financial goals, it can support organization to create innovative internal environment where new ways of reducing environmental impacts can simultaneously create significant operative improvements and

innovations. Being “green” eventually can improve firm’s image among consumers and other strategic stakeholders who are becoming ever more critical towards companies that are acting unsustainably. These findings are in line with the overall EMA literature and supporting authors (Burritt, 2004; Christ & Burritt, 2013; Calantone et. al, 2002; Henri & Journeault, 2007) which in their studies find that driving towards sustainable business models are not violating against the profit maximization.

7.3 FUTURE RESEARCH AND LIMITATIONS

Based on this study, there are several research areas that could be researched more. One that has been previously mentioned as well, is the future role of accountants and controllers. It should be researched whether the organizations from a wider range support the accounting professionals to deal more with the environment related processes. As this study favors, the accounting professionals should be able to understand environment related information and relationships, especially if working the surface between these two areas. Thus, this would be interesting further research area.

Another concrete further research questions would be to investigate more fundamental reasons why some organizations have implemented already at the beginning so environmental focused culture and some are not. As this study gives several possible explanations, this question could be researched from a bigger group of companies, trying to identify the most common triggers and principles beyond the visible reasons. It could provide information on how organizations could be pushed more on towards integrating environmental performance processes into their accounting processes.

Additional future research suggestion is to investigate in which processes are environmental performance data further used. As this study revealed, marketing and communication processes receive valuable information from the environmental performance measurement processes. Future research could assess and define how valuable different processes sees the environmental performance data. As this study has focused on the accounting processes and how environmental performance measurement can be useful for those processes, there certainly are other functions, internal and external, that benefit from the integration via improved data accessibility.

As a limitations for this study is that this is only considering one firm which is relatively unique on its own industry and geographical location. To break this limitation, and to provide one more future research idea is to repeat similar study for multiples companies and in different market and geographical locations. The market area where the company is operating is also a relatively unique and small, making the organization to be almost one-of-a-kind. Also the interviewed persons presents management level in their functions and to receive even more thorough understanding and insight from the organization, more employees and managers should been interviewed.

7.4 SUMMARY OF THE RESEARCH

As environmental regulations and market controls are getting more strict, it is clear that firms have to be able to adjust their operations and strategies accordingly (Henri & Journeault, 2007). Possible environmental crises are one of the greatest challenges of the 21th century and businesses are finally getting to realize these risks (Bititci et al., 2012) and radical changes are required (COCC, 2016).

This study placed its research questions to focus on how environmental performance measurement can be linked into the accounting processes in organizations to further assist organizations to meet environmental requirements. This study managed to find answers to given research questions, providing more information about how the integration can executed and what kind of challenges there exist.

In terms of research gaps this study was interested to provide more practical examples of the reality and how companies in reality are integrating environmental performance measurement and EMA practices. Other issued research gap was related to how existing organizational structure is affecting on environmental performance management and measurement processes. For both of these gaps, this study was able to find some new evidence and empirical results to support future research.

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APPENDICES

Measuring environmental performance, structure and purpose

What kind of model for the environmental performance? Starting points and targets.

How does the organization utilize environmental performance information

- *Environmental performance in environmental management*
- *Environmental performance in operative management*
- *Environmental performance in cross-functional processes*

How important environmental performance measurement is in different areas?

- *In the field of operative management*
- *In the field of strategic management*

How environmental information is visible in following processes

- *Accounting control functions*
- *Accounting financial analysis functions*
- *Accounting reporting*

Integration between accounting and environmental performance measurement

Where the integration of environmental performance and accounting is visible?

How do you think where EMA information will be used inside the organization?

- *To what for is it used?*
- *And why is it used?*

Challenges towards environmental performance measurement and integration

Does the current system work?

- *What are the benefits?*
- *What are the disadvantages?*

Is the performance information used enough?

- *In the field of operative management*
- *In the field of environmental mangement*

What things should be done in order to improve the integration between environmental performance measurement and management accounting processes?

Organizational culture

How does organizational culture affect on selected environmental measuring indicators and practices?

Does the existing organizational culture support these principles?

Is there conflicts between financial and environmental targets on any level?

- *Which measures are more important?*

How well the co-operation between accounting and environmental functions is happening?

- *What concrete tools, models, organizational structures there are to support the integration*

Do accounting and environmental employees " speak the same language"?

- *Does the communication work?*
- *Should employees from accounting and business side understand more about environmental theories and practises?*